

Reference letters.

<i>a.</i> Anus.	<i>dt.</i> Testis-duct.
<i>al.</i> Intestine.	<i>m.s'</i> Suspensory ligament of ovary.
<i>bl'</i> Urocyt (so-called urinary bladder).	<i>m.s''.</i> Mesenteric fold.
<i>bl''.</i> Orifice of the same.	<i>ov'</i> Right ovary.
<i>br'</i> Bristle passed from interior of right ovary into testis-duct.	<i>ov''.</i> Left ovary.
<i>br''.</i> Bristle passed into porus genitalis of right side.	<i>ts.</i> Testis.
<i>d.g'</i> Genital duct.	<i>s.</i> Urino-genital sinus.
<i>d.g''.</i> Orifice of the same.	<i>v'</i> Longitudinal septum of testis-duct.
	<i>v''.</i> Valve-like fold at base of testis-duct.
	<i>v.o.</i> Ovarian vein.

A Revised Classification of the TUNICATA, with Definitions of the Orders, Suborders, Families, Subfamilies, and Genera, and Analytical Keys to the Species. By W. A. HERDMAN, D.Sc., F.L.S., Professor of Natural History in University College, Liverpool.

[Read 5th February, 1891.]

DURING the three years which have elapsed since the last part of the report upon the Tunicata collected during the 'Challenger' Expedition was written, I have had opportunities of examining, more or less in detail, many large collections of Tunicata from various parts of the world, including especially three important series of specimens from Australian seas which are now in my laboratory, viz.:—the collection of the Australian Museum, Sydney (from which I am drawing up a Museum Catalogue); a collection made by Mr. Bracebridge Wilson in the neighbourhood of Port Phillip, and sent to me for description by Prof. Baldwin Spencer; and, lastly, the collection made by Prof. Haddon in the Torres Straits. I have also been able to make a number of observations from the living animals on various parts of our own and the French coasts. Consequently I feel that I am in a position now to revise the classification put forward in the 'Challenger' Report, to deal with those few genera not included in that work and those described since 1888, and to

differentiate, so far as can be done in tabular form *, under each genus the numerous species not represented in the 'Challenger' Collection.

There has never been any sufficiently comprehensive work on the Tunicata describing all the known species, and although this present classification and series of tables cannot pretend to be such a revision, still it may be useful as a preliminary essay in that direction, clearing the ground and marshalling the species in groups. I can scarcely hope that my system of classification will commend itself at all points to my fellow-workers: in the primary divisions and subdivisions, however, I have made practically no change upon the 'Challenger' system, which has been adopted by most writers on the Tunicata since. Still less can I hope to have escaped error in the enumeration and arrangement of the numerous species. The literature of the Tunicata is so scattered, and many of the descriptions so meagre or even misleading, that it is very difficult in the first place to collect the literary material, and in the second place to arrange it correctly. The first to attempt this work in a group is pretty sure to commit sins both of omission and of commission, but may reasonably hope for lenient treatment from his critics. I shall be very glad to receive and acknowledge corrections and additions to the lists.

I desire to acknowledge with cordial thanks the very efficient assistance I have received from two advanced students of University College, Liverpool, Miss A. E. Warham, B.Sc., and Miss J. H. Willmer, who, while working in my laboratory during the past year, have prepared for me microscope specimens and drawings of a very large number of Ascidians. Miss Warham especially has devoted a great deal of time to sectionizing numerous colonies of Compound Ascidians; and both ladies have undertaken a part of the laborious work of looking-up references, of collecting together the various species of the genera and of comparing the characteristics given by different authors, and so have enabled me to complete the tables much sooner than with my very limited leisure would otherwise have been possible.

Although a linear classification, such as this of necessity is,

* Occasionally the characters made use of in some of the tables are not quite satisfactory. It is not possible in all cases to distinguish allied species by one or two characteristics briefly put. They will serve, however, to indicate which original descriptions should be consulted.

cannot express adequately the relations existing between the various groups, still I believe that these groups are all natural assemblages, with the exception of the "*Ascidiae Compositae*," which is to be regarded as being polyphyletic in origin, having been derived from several distinct groups of simple Ascidians which have independently acquired the property of budding so as to form colonies. I believe, then, that although it is a matter of convenience to retain still the suborder *Ascidiae Compositae*, it may some day become necessary to break up this artificial assemblage of colonial forms, and to place the sections beside their nearest allies amongst the *Ascidiae Simplicies*.

I have purposely abstained from being too critical in regard to closely related or poorly defined genera and species, believing it to be more useful in this preliminary revision of the group to admit all such doubtful forms if they have any characteristic by which they can be distinguished. A number of the older species of the *Tunicata* require to be examined afresh (those it is possible to obtain) and re-described, as the original descriptions are no longer sufficient to characterize them properly and to distinguish them from the numerous species which have been described (more fully) since. I have thought it better to err on the side of admitting into the tables some of these imperfectly characterized species rather than to run the risk of doing an injustice to former authors by suppressing species which may eventually turn out to be distinct and entitled to recognition. Others of the older species which in the present state of our knowledge cannot be placed in the tables, but which I do not *know* to be mere synonyms, have been referred to in footnotes or put in separate lists under the genera to which they probably belong.

I have inserted the authorities and the dates of formation of the various groups, but have not considered it necessary to encumber the text with references to the original papers. There can be no difficulty from the author's name and the date in finding the work in question in any bibliography of the *Tunicata*, such as that given in the 'Challenger' Reports *. I have

* It is unnecessary to acknowledge in detail the full use I have made of the published works of my predecessors and fellow-workers at the *Tunicata*, as I have ransacked every paper known to me for lists, characters, and other hints as to the affinities of those species I have not been able to examine myself. I have found specially useful the recent papers of Traustedt, Sluiter, von Drasche, and Lahille.

also, after the authorities for the species, given in brackets a brief indication of the geographical distribution of each species, and have there made use of the following contractions:—N. Atl. (North Atlantic); S. Atl. (South Atlantic); N.W. Eur. (the north-western coasts of Europe, such as British area, Danish seas, &c.); E. N. Am. (the eastern coast of North America); Arct. (the Arctic seas); W. Ind. (the West Indies); Med. (the Mediterranean, including the Adriatic); Red S. (the Red Sea); Ind. O. (the Indian Ocean); Mal. (the seas of the Malay Archipelago); Austr. (the coasts of Australia); A. Arct. (the Antarctic); Mag. (Straits of Magellan and the neighbourhood); S. Pac. (South Pacific); N. Pac. (North Pacific Ocean); and Jap. (Japanese Coast).

TUNICATA, *Lamk.*, 1816.

This class is divided into three Orders, the Ascidiacea, the Thaliacea, and the Larvacea.

Order I. ASCIDIACEA, *Blv.*, 1827.

This group includes fixed or free-swimming Simple or Compound Ascidians, which in the adult are never provided with a tail and have no trace of a notochord. The free-swimming forms are colonies, and the simple Ascidians are never free-swimming.

The test is permanent and well developed; as a rule it increases with the age of the individual.

The musculature of the mantle is in the form of an irregular network, there being no regular circular bands.

The branchial sac is large and well developed. Its walls are perforated by numerous slits (the stigmata) opening into a single peribranchial cavity, which communicates with the exterior by the atrial aperture.

The anus opens into the peribranchial cavity.

Many of the forms reproduce by gemmation, and in most of them the sexually produced embryo develops into a tailed larva.

The Order Ascidiacea is divided into three Sections—the Ascidiæ Simplicēs, the Ascidiæ Compositæ, and the Ascidiæ Luciæ.

Suborder I. *ASCIDIÆ SIMPLICES*, Savigny, 1816.

This group contains fixed (rarely unattached, but never free-swimming) Ascidians which are solitary, and very rarely reproduce by gemmation; if colonies are formed, the members of the colony are not buried in a common investing mass, but each has a distinct test of its own.

The Ascidiæ Simplicēs include four families—the Molgulidæ, the Cynthiidæ, the Ascidiidæ, and the Clavelinidæ.

Family I. *MOLGULIDÆ*, *Lac.-Duth.*, 1877.

Body usually free, sometimes fixed, rarely pedunculated.

Test cartilaginous, coriaceous, or membranous, usually covered with sand &c., which adheres to long hair-like processes of the test. Branchial aperture 6-lobed, atrial aperture 4-lobed.

Branchial sac usually longitudinally folded (5 to 7 folds on each side); internal longitudinal bars not papillated; stigmata more or less curved, usually arranged in spirals.

Tentacles always compound, usually much branched.

Intestine attached to the inner surface of the mantle on the left side.

Renal sac present, upon the right side of the body.

Gonads on the inner surface of the mantle, usually developed on both sides. Larvæ usually tailed, in a few species anurous.

This is the most highly differentiated family of the Ascidiæ Simplicēs. It contains the following genera:—

	{	Branchial sac with no folds.....	1
		Branchial sac with from 5 to 7 longitudinal folds on each side.....	2
1	{	A pair of gonads, one on each side, the left one anterior to the intestine.....	Paramolgula.
		A single gonad, alongside intestine.....	
3	{	Infundibula large, conical, placed in longitudinal rows, one in each mesh	Eugyra.
		Infundibula relatively small, corkscrew-like, many in each mesh.	

2	{	Body attached, pedunculated, free from sand, and with stigmata not in spirals	Ascopera.	4
		Generally free, globular, and sandy, with stigmata in spirals		
4	{	With 5 folds on each side of the branchial sac.....	Pera.	5
		With 6 or 7 folds on each side		
5	{	With the branchial and atrial lobes lacinated	Ctenicella.	6
		With no such lacination		
6	{	With a single gonad, on the left side.....	Eugyriopsis.	
		With 2 gonads, one on each side	Molgula.	

PARAMOLGULA, Traustedt, 1885.

Body free.

Test covered with adhering sand.

Branchial sac with no folds. Stigmata spirally coiled and arranged in infundibula.

Gonads present on both sides of the body.

This genus contains the single species

Paramolgula Schulzii, Traustedt. (Mag.)

EUGYRA, Alder & Hancock, 1870.

Body globular, unattached. Branchial aperture 6-lobed, atrial 4-lobed.

Test usually thin and transparent, incrustated with sand or plain.

Branchial sac with no folds. Internal longitudinal bars few, broad, and ribbon-like. Infundibula large, conical, formed of regularly coiled vessels, which form a double spiral meeting at the apex. They are placed in longitudinal rows, one in each mesh.

Tentacles compound.

Gonad forming a single mass situated on the left side close to the intestine.

The species of this genus may be distinguished as follows :—

{	{	Body attached by a very long peduncle.	<i>E. pedunculata</i> , Traust. (Arct.)	1
		Body not pedunculated		
1	{	Test thin, transparent, without sand.	<i>E. kerguelensis</i> , Herdm. (A. Arct.)	2
		Test opaque, covered with sand		

2	{	Siphons concealed by a fold of anterior end of test.		
		<i>E. bilabiata</i> , Sluit. (Mal.)		
		Siphons not concealed by a fold		3
3	{	Both siphons very long, as long as diameter of body.		
		<i>E. pilularis</i> , Verr. (E. N. Am.)		
		Siphons not very long		4
4	{	Gonad confined to intestinal loop, 60 tentacles.		
		<i>E. adriatica</i> , v. Dr. (Med.)		
		Gonad not confined to intestinal loop		5
5	{	Gonads paired *	<i>E. symetrica</i> , v. Dr. (Arct. & Med.)	
		Gonad single, crossing over intestinal loop		6
6	{	With a circular area on side free from sand.		
		<i>E. glutinans</i> , Möll. (Atl.) (= <i>E. arenosa</i> , Ald. & Hanc.)		
		Body entirely covered with sand.	<i>E. globosa</i> , Hanc. (N.W. Eur.)	

BOSTRICHOBRANCHUS, *Traustedt*, 1882.

Body free, sometimes sandy.

Test moderately thick and tough, wrinkled.

Branchial sac with no folds. Infundibula of small size, cork-screw-like, and placed many in a mesh.

Gonad present on the left side only.

This genus contains a single species, *Bostrichobranchnus manhattensis*, Dekay, from the east coast of North America.

ASCOPEA, *Herdman*, 1880.

Body more or less pyriform, pedunculated, attached.

Test thin, between membranous and leathery in texture, having no adhering sand and no hair-like processes.

Branchial sac with seven folds on each side. Stigmata straight or curved, but not arranged in spirals. No infundibula.

Tentacles compound.

Alimentary canal on left side, running antero-posteriorly.

Gonads developed on both sides. The gland on the left side lies ventral to the rectum.

There are two species, separated thus:—

* This species seems to belong to *Paramolgula* rather than to *Eugyra*?

- { Body pyriform, stalk short, stigmata mostly curved.
A. gigantea, Herdm. (Kerguelen Isl.)
 { Body club-shaped, stalk long, stigmata mostly straight.
A. pedunculata, Herdm. (Kerguelen Isl.)

PERA, *Stimpson*, 1852.

Body attached or free, may be slightly stalked.

Test sandy or not.

Branchial sac with five folds on each side. Stigmata in spirals or in rows.

This genus (which is simply those Molgulids with five folds only on each side of the branchial sac) contains four species* :—

- | | | | | |
|---|---|---|--|---|
| | { | Test delicate and transparent | <i>P. chrystallina</i> , Möll. (N. Atl.) | |
| | { | Test opaque and more or less sandy | | 1 |
| 1 | { | With very long branchial and atrial siphons. | | |
| | | | <i>P. longicollis</i> , Wagner. (Arct.) | |
| | { | With the siphons short or inconspicuous | | 2 |
| 2 | { | Stigmata of branchial sac curved... | <i>P. Hancocki</i> , Herdm. (N.W. Eur.) | |
| | { | Stigmata straight | <i>P. Carpenteri</i> , Herdm. (N. Atl.) | |

CTENICELLA †, *Lacaze-Duthiers*, 1877.

Body fixed.

Test covered with sand. Branchial and atrial lobes lacinated or cleft at their edges into numerous sharp processes. Atrial siphon furnished with a bilobed valve.

Branchial sac with seven folds on each side. Stigmata spirally coiled, arranged in infundibula.

Dorsal lamina with the margin toothed.

Gonads present on both sides of the body.

The four species of *Otenicella* may be distinguished thus:—

- | | | |
|---|--|------------------------------------|
| { | Dorsal tubercle horseshoe-shaped | <i>C. Lanceplaini</i> , Lac.-Duth. |
| | | (N.W. Eur.) |
| { | Dorsal tubercle S-shaped | 1 |

* *Pera Huxleyi*, Macd., is a *Rhodosome* (see Ascidiidæ).

† *Molgula complanata*, Ald. & Hanc. (N.W. Eur.) may belong to this genus. If so, it differs from the other species of *Ctenicella* in having only 6 folds on the left side (right, of Hancock) of the branchial sac. *Lithonephrya eugyrida* of Giard probably belongs to *Ctenicella*.

- | | | | |
|---|---|--|---|
| 1 | { | Dorsal tubercle with long axis parallel to long axis of body | 2 |
| | | Dorsal tubercle with long axis transverse to long axis of body.
<i>C. Morgatæ</i> , Lac.-Duth. (Med.) | |
| 2 | { | Tentacles slightly branched, dorsal lamina strongly toothed.
<i>C. appendiculata</i> , Heller. (Med.) | |
| | | Tentacles well branched, dorsal lamina slightly toothed.
<i>C. Korotneffii</i> , Lac.-Duth. (N.W.
Eur. & Med.) | |
| | | | |

MOLGULA *, *Forbes*, 1853.

Body usually globular, attached or free, often encrusted with sand and mud. Branchial aperture 6-lobed, atrial 4-lobed; lobes not lacinated.

Test usually thin, but tough; often with hair-like processes on the outer surface.

Mantle thin and membranous; musculature usually feeble, consisting chiefly of long radiating bundles arising from the bases of the siphons, and of short fusiform clumps of fibres scattered through the mantle.

Branchial sac with 6 or 7 longitudinal folds on each side. Stigmata more or less curved, coiled spirally in infundibula.

Tentacles compound.

Alimentary canal on the left side of the branchial sac.

Gonads developed on both sides.

Renal organ in the form of a crescentic sac placed in the centre of the right side of the mantle, and usually containing concretions.

The numerous species † of *Molgula* which have been sufficiently characterized may be separated as follows:—

- | | | | |
|---|--|--|---|
| { | With 6 folds on each side of the branchial sac | 1 | |
| | With 7 folds | 2 | |
| 1 | { | Lower ends of the folds provided with tongue-like processes.
<i>M. euprocta</i> , v. Dr. (Med.) | |
| | | No such processes present | 3 |

* Includes *Gymnocystis*, Giard, and *Anurella*, Lac.-Duth.

† *Molgula psammodes* was described by Traustedt in 1880, but was not included in the table of species of the genus given by the same author in 1882, and consequently has probably been given up. According to Carus, it is the same as *M. occulta*, Kupff.

3	{ Small papillæ on the edges of the stigmata.	[Eur.]
	{ No such papillæ	<i>M. impura</i> , Heller. (Med., N.W.)
4	{ Dorsal tubercle elongated, not horseshoe-shaped	5
	{ Dorsal tubercle horseshoe-shaped	6
5	{ Dorsal tubercle nearly linear, subarcuate.	
	{ Dorsal tubercle irregularly convoluted, serpentiform.	<i>M. eugyroides</i> , Traust. (S. Atl.)
		<i>M. Holtiana</i> , Herdm. (N.W. Eur.)
6	{ Aperture between horns of dorsal tubercle turned to the left.....	7
	{ Aperture turned posteriorly	8
7	{ 4 to 6 inter. longit. bars on a fold; anus with plain free edge.	
		<i>M. Koreni</i> , Traust. (W. Ind.)
	{ 2 to 4 inter. longit. bars on a fold	9
9	{ Anus with a fringed edge	<i>M. simplex</i> , A. & H. (N.W. Eur.)
	{ Margin of anus smooth	<i>M. macrosiphonica</i> , Kupf. (N.W. Eur.)
8	{ Edge of dorsal lamina entire	10
	{ Edge of dorsal lamina toothed	11
10	{ Anus with a plain edge	<i>M. tenax</i> , Traust. (W. Ind.)
	{ Anus with a fringed edge.....	12
12	{ 3 int. long. bars on a fold	<i>M. ampulloides</i> , v. Ben. (N.W. Eur., Med.)
	{ 4 int. long. bars on a fold	<i>M. socialis</i> , Alder. (N.W. Eur.)
11	{ Anus with plain edge	<i>M. Lutkeniana</i> , Traust. (N.W. E.)
	{ Anus with a fringed edge	<i>M. tubifera</i> , CErsted. (N.W. Eur.)
2	{ Dorsal tubercle simple, circular, and funnel-shaped, no horns.	
		<i>M. pyriformis</i> , Herdm. (S. Atl.)
	{ Dorsal tubercle curved, with horns.....	13
13	{ Dorsal tubercle horseshoe-shaped	14
	{ Dorsal tubercle S-shaped	15
14	{ Margin of dorsal lamina fringed or toothed	16
	{ Margin of dorsal lamina plain	17
16	{ Only the posterior half of body sandy.	
		<i>M. gigantea</i> , Cunn. (Mag.)
	{ The whole of body sandy	<i>M. occulta</i> , Kupf. (N.W. E., Med.)
17	{ Siphons retracted between folds of test; no sand between the aper- tures	<i>M. oculata</i> , Forb. (N.W. Eur.)
	{ No such folds of test present	18
18	{ Papillæ on the margins of the stigmata.	
		<i>M. occidentalis</i> , Traust. (W. Ind.)
	{ No such papillæ present	19
19	{ Horns of dorsal tubercle merely turned in	20
	{ Horns of dorsal tubercle coiled spirally; aperture turned to right side	21
20	{ Test not sandy	22
	{ Test sandy	23
22	{ Outside of siphons echinated, or having pointed projections	24
	{ Siphons not echinated	25

- 24 { Only the branchial siphon echinated. *M. echinosiphonica*, Lac.-Duth. [(N.W. Eur.)
Both siphons echinated *M. nuda*, Wagn. (Arct.)
- 25 { Body globular, not attached *M. cæpiformis*, Herdm. (N.W. E.) 26
Body attached 26
- 26 { With a short peduncle *M. pedunculata*, Herdm. (A. Arct.) 27
With no peduncle..... 27
- 27 { Attached by a wide area partly on left side. *M. citrina*, A. & H. (N.W. Eur.)
Attached by a narrow area at posterior end. *M. Helleri*, v. Dr. (Med.)
- 23 { Aperture of dorsal tubercle turned to right side; anus with entire free edge..... 28
Aperture of dorsal tubercle turned posteriorly; anal margin entire, but adhering *M. septentrionalis*, Traust. (?Arct.)
- 28 { Six series of conical papillæ on the test round the branchial aperture. *M. nana*, Kupff. (N.W. Eur.)
No such papillæ present; siphons long. [Eur.)
M. solenota, Lac.-Duth. (N.W.)
- 21 { No sand &c. on the test *M. gregaria*, Less. (Mag.) 29
Test sandy 29
- 29 { Mantle thick and opaque, with muscles forming a close network. *M. horrida*, Herdm. (Mag.)
Mantle thin, transparent, with the usual Molgulid musculature 30
- 30 { Inferior margin of anus adhering 31
Margin of anus entire, free; large genital papillæ on each side of rectum *M. Bleizi*, Lac.-Duth. (N.W. Eur.)
- 31 { Stigmata small and short; anus bilabiate. *M. grænlandica*, Traust. (N. Atl.)
Stigmata very long; anus rounded... *M. roscovita*, Lac.-Duth. (N.W. Eur.)
- 15 { 4 int. long. bars on a fold *M. Forbesi*, Herdm. (Austr., Mal.)
5 or 6 int. long. bars on a fold *M. Martensii*, Traust. (Ind. O.)

Molgula boreas, Traustedt (Arct. ?), appears to come in here beside *M. Forbesi* and *M. Martensii*, but I am unable to find a description which will give differentiating characters.

EUGYRIOPSIS, Roule, 1885.

Body ovoid, attached; not incrustated with sand.

Test smooth, thick, with no hair-like processes.

Mantle thin; musculature weak, but both longitudinal and transverse.

Branchial sac with 7 folds on each side. Stigmata curved, and coiled spirally in infundibula.

Tentacles compound.

Alimentary canal on the left side.

Gonad single, placed on the left side, anterior to the intestinal loop.

This genus contains the single species *Eugyriopsis Lacazei*, Roule, from the shores of Provence.

The following Molgulids cannot, on account of the very imperfect descriptions which have been given of them, be placed in any of the tables. Probably most of them belong to the genus *Molgula*; several may be synonyms, or young conditions of other species:—

- M. tubulosa*, Rathke. (N.W. Eur.)
- M. inconspicua*, Stimps. (Austr.) Only 4 branchial folds?
- M. inconspicua*, Ald. & Hanc. (N.W. Eur.) 6 branchial folds.
- M. sordida*, Stimps. (E. N. Am.)
- M. producta*, Stimps. (E. N. Am.)
- M. arenosa*, Stimps. (E. N. Am.)
- M. pannosa*, Verr. (E. N. Am.)
- M. retortiformis*, Verr. (E. N. Am.)
- M. littoralis*, Verr. (E. N. Am.)
- M. papillosa*, Verr. (E. N. Am.)
- M. pilularis*, Verr. (E. N. Am.)
- M. pellucida*, Verr. (E. N. Am.)
- M. labeculifera*, Stimps. (China.) [? Ascidiidæ.]
- M. conchilega* (?).
- Cæsira parasitica*, Macd. (Austr.)
- C. ficus*, Macd. (Austr.) 7 branchial folds.
- C. pellucida*, Macd. (Austr.)
- M. siphonata*, Ald. (N.W. Eur.)
- M. adhærens*, Giard. (N.W. Eur.)
- Lithonephrya decipiens*, Giard. (N.W. Eur.)
- Gymnocystis comosa*, Giard. (N.W. Eur.)
- Eugyra arenata*, Verr. (E. N. Am.)

Family II. CYNTHIIDÆ, Lac.-Duth., 1877.

Body usually attached, rarely free, sometimes pedunculated.

Test membranous or coriaceous, rarely cartilaginous or covered with sand. Branchial aperture usually 4-lobed, atrial 4-lobed.

Branchial sac longitudinally folded; internal longitudinal bars not papillated. Stigmata straight, never forming spirals.

Tentacles simple or compound.

Intestine on the left side, only slightly, or not at all, attached to the mantle.

Gonads on the inner surface of the mantle, either on both sides or on one only.

This very large and important family contains three well-marked sections or subfamilies—the *Bolteniinæ*, the *Cynthiinæ*, and the *Styelinae*.

Subfamily BOLTEINIINÆ, *Herdman*, 1880.

Body attached and pedunculated; peduncle usually very long; branchial and atrial apertures having either 4 or less than 4 lobes.

Test coriaceous, membranous or cartilaginous, not covered with sand.

Branchial sac with more than four folds on each side.

Tentacles compound.

This subfamily includes four genera, which may be separated thus:—

	{	Fine longitudinal vessels and stigmata present	Boltenia.	1
		No fine longit. vessels in branchial sac		
1	{	Branchial aperture 4-lobed	Cystingia.	2
		Branchial aperture more or less triangular		
2	{	Stalk relatively short and thick	Fungulus.	
		Stalk relatively long and slender	Culeolus.	

BOLTENIA, *Savigny*, 1816.

Body more or less globular, fixed on a long peduncle; apertures lateral, 4-lobed.

Test coriaceous or cartilaginous.

Branchial sac longitudinally folded, with 6 or more folds on each side. Fine longitudinal vessels present, forming straight stigmata.

Tentacles compound.

Dorsal languets present.

The species of *Boltenia** may be distinguished as follows:—

	{	Peduncle not longer than body	<i>B. legumen</i> , Lesson (Mag.)	1
		Peduncle many times longer than body		
1	{	Body globular or nearly ovate, regular		2
		Body irregular, flattened or lobed		

* *Clavelinopsis rubra*, Fewkes, is probably a *Boltenia*, but the description insufficient.

2	{ Peduncle sublateral.....	<i>B. ovifera</i> , Linn. (N. Atl.)	
	{ Peduncle terminal and median		4
4	{ Body subreniform	<i>B. reniformis</i> *, MacL. (Arct.)	
	{ Body elongate-ovate		5
5	{ Branchial aperture on same level with peduncle; apertures sessile.	<i>B. elegans</i> , Herdm. (N. Atl.)	
	{ Branchial aperture not on same level with peduncle; apertures prominent	<i>B. fusiformis</i> , Sav. (Arct.)	
3	{ With large lobes or tubercles from the test		6
	{ With no such projections.....		7
6	{ No spicules in the branchial sac	<i>B. gibbosa</i> , Heller. (Austr.)	
	{ With spicules in the branchial sac ...	<i>B. tuberculata</i> , n. sp. (Austr.)	
7	{ Body much elongated, narrow fusiform.	<i>B. Bolteni</i> , Linn. (Arct.)	
	{ Body not so elongated.....	<i>B. pachydermatina</i> , Herdm. (S. Pac., Austr.)	

CYSTINGIA, MacLeay, 1824.

Body ovate, attached to a very short peduncle. Branchial aperture 4-lobed, atrial irregular, both sessile.

Test subcoriaceous.

Branchial sac with longitudinal folds (about fourteen). The transverse vessels and longitudinal bars form a loose meshwork not divided into true stigmata by fine longitudinal vessels.

Tentacles compound.

Alimentary canal on left side; stomach very long.

Gonads on both sides of body.

There is only one species known, *Cystingia Griffithsii*, MacLeay, brought from the Arctic Seas near Winter Island by Mr. W. N. Griffiths, who accompanied Captain Parry.

The following species, probably belonging to *Boltenia*, are insufficiently characterized and cannot be placed:—

Boltenia rubra, Stimpson. (E. N. Am.)

B. microcosmus, Ag. (E. N. Am.)

B. Burkhardtii, Ag. (E. N. Am.)

B. ciliata, Möller. (Arct.)

B. australis, Q. & G. (Austr.)

B. spinifera, Q. & G. (Austr.)

FUNGULUS, Herdman, 1882.

Body globular, borne on a short thick peduncle attached to the anterior end. Branchial aperture triangular, atrial bilabiate.

Test cartilaginous, but very thin, not modified on the peduncle.

* *Ascidia clavata*, Fabr., may be this species.

Branchial sac with several slight folds on each side; meshes square, no stigmata. No spicules present in the walls of the vessels.

Dorsal lamina a plain membrane.

Tentacles compound.

Gonads a single gland on each side.

This genus contains the single species *Fungulus cinereus*, Herdm., dredged during the 'Challenger' Expedition in the Southern Ocean from a depth of 1600 fathoms.

CULEOLUS, *Herdman*, 1880.

Body fixed, pedunculated, more or less ovate; the anterior end, where the long peduncle is attached, is narrower than the posterior. Branchial aperture more or less triangular; atrial aperture bilabiate.

Test cartilaginous, often very thin, usually rough and papillated on the outer surface.

Mantle thin, musculature not greatly developed.

Branchial sac with about 6 longitudinal folds on each side; consisting of transverse vessels and internal longitudinal bars, forming a wide-meshed network. There are no stigmata, the fine longitudinal vessels being absent. The larger vessels, especially the internal longitudinal bars, are supported by a system of branched calcareous spicules.

Endostyle also strengthened by numerous branched calcareous spicules.

Dorsal lamina represented by a series of triangular languets.

Tentacles compound.

Alimentary canal relatively small, placed posteriorly on the left side; stomach ventral, intestine turned anteriorly and dorsally, and rectum running posteriorly.

Gonads on the inner face of the wall of the peribranchial cavity, developed on both sides of the body.

This is one of the most remarkable and characteristic of the abyssal genera of Ascidians. The seven known species were all discovered during the voyage of the 'Challenger.'

The species may be distinguished by external features as follows *:—

* For a table of distinguishing characters taken from internal structure, see 'Challenger' Report, part i. p. 126.

	{ Peduncle turned posteriorly		1
	{ Peduncle turned anteriorly		2
1	{ Dorsal end fringed with papillæ ... <i>C. recumbens</i> , Herdm. (A. Arct.)		
	{ Dorsal end not fringed <i>C. perlucidus</i> , Herdm. (A. Arct.)		
2	{ Dorsal end fringed with papillæ.....		3
	{ Dorsal end not fringed.....		4
3	{ Surface even <i>C. perlatus</i> *, Suhm. (N. Atl.)		
	{ Surface very uneven <i>C. Murrayi</i> , Herdm. (N. Pac.)		
4	{ Atrial aperture on dorsal edge behind middle.		
	{ Atrial aperture in centre of posterior end <i>C. Willemoesi</i> , Herdm. (N. Pac.)		5
5	{ Surface even <i>C. Moseleyi</i> , Herdm. (Pac.)		
	{ Surface very uneven, but smooth ... <i>C. Wyville-Thomsoni</i> , Herdm. (S. [Pac.]		

Subfamily CYNTHIINÆ, *Herdman*, 1880.

Body attached, sessile or very shortly pedunculated. Branchial and atrial apertures with 4 lobes each.

Test coriaceous, rarely cartilaginous, rarely covered with sand.

Branchial sac with more than 4 folds upon each side (except *Forbesella tessellata*, Forbes).

Tentacles compound.

Alimentary canal with no marked stomach, but with a glandular lobed appendage.

There are four genera :—*Microcosmus*, *Cynthia*, *Forbesella*, and *Rhabdocynthia*. The last is a new genus which I am forming for the reception of all those species of *Cynthia* which are provided with needle-like or rod-like spicules of carbonate of lime scattered through their tissues; and *Forbesella* is a new genus which I consider necessary for the remarkable *Cynthia tessellata* of Forbes, which differs from all other Cynthiinae in having only 4 folds on each side of the branchial sac.

	{ With only 4 folds present on each side		Forbesella.	
	{ With more than 4 folds on each side			1
1	{ Dorsal lamina plain, intestinal loop narrow		Microcosmus.	
	{ Dorsal lamina toothed, intestinal loop wide			2
2	{ Rod-like or curved calcareous spicules in tissues...		Rhabdocynthia.	
	{ No such spicules present		Cynthia.	

* *Culcolus Tanneri*, Verr. (N. Atl.), is close to this species It may be distinct, but has not yet been fully described.

MICROCOSMUS, *Heller*, 1877.

Body attached, sessile, not incrustated with a continuous coating of sand. Apertures both 4-lobed. A fold of the mantle, covered by the invaginated test, usually present at the base of the siphons.

Test coriaceous, thin but tough.

Branchial sac with more than 4 folds upon each side.

Dorsal lamina a plain untoothed membrane.

Tentacles compound.

Intestine forming a narrow loop, on the left side of the body.

Gonads on both sides, on the left partly covering the intestine.

The species of *Microcosmus* may be distinguished as follows:—

Branchial sac with 5 folds on each side.	
<i>M. oligophyllus</i> , Heller. (S. Atl.)	
1	Branchial sac with more than 5 folds on each side 1
1	Branchial sac with 6 folds on each side..... 2
	Branchial sac with more than 6 folds on each side 3
2	Tentacles fewer than 12..... <i>M. gleba</i> , Traust. (Pac.)
	Tentacles 20, or more 4
4	Tentacles 20; dorsal tubercle simple, cordate.
	<i>M. Helleri</i> , Herdm. (Austr.)
	Tentacles 28; dorsal tubercle complex, formed of 2 spiral cones.
<i>M. Herdmani</i> , v. Dr. (S. Atl.)	
3	Branchial sac with 7 folds on each side 5
	Branchial sac with more than 7 folds on each side 6
5	With not more than 6 or 7 stigmata in a mesh..... 7
	With about 12 stigmata in a mesh... <i>M. propinquus</i> , Herdm. (Austr.)
7	With 4-5 stigmata in a mesh 8
	With 6-7 stigmata in a mesh <i>M. anchylodeirus</i> , Traust. (W. Ind.)
8	Surface of test rough, corrugations irregular and granular 9
	Surface not so rough, corrugations regular and smooth 10
9	With an extraordinarily long branchial siphon.
	<i>M. scrotum</i> , D. Ch. (Med.)
Branchial siphon not very long <i>M. polymorphus</i> , Heller. (Med. & [Austr.]	
10	Pinnæ of the tentacles unbranched, 12-14 bars on branchial fold.
	<i>M. vulgaris</i> , Heller. (Atl. & Med.)
	Pinnæ of the tentacles bearing small pinnules, 18-20 bars on fold.
<i>M. Sabatieri</i> , Roule. (Med.)	
6	Branchial sac with 8 folds on each side 11
	Branchial sac with more than 8 folds on each side 12
11	With 16-20 tentacles, surface rough. <i>M. exasperatus</i> , Heller. (W. Ind.)
	With 20-25 tentacles, surface nearly smooth.
<i>M. distans</i> , Heller. (W. Ind.)	
12	Branchial sac with 9-10 folds on each side 13
	Branchial sac with 12 or more folds on each side 14
13	The 3 lower folds do not reach œsophageal aperture. [W. Ind.)
	<i>M. variegatus</i> , Heller. (Med.,
All the folds extending beyond the œsophageal aperture 15	

- 15 { With 14-16 tentacles *M. claudicans*, Sav. (N.W. Eur.,
[Pac., Med., Ind. O.)
With 18-20 tentacles *M. affinis*, Heller. (Austr.)
- 14 { With 14 folds on each side *M. Julinii*, v. Dr. (Austr.)
With 12 folds on each side *M. Draschii*, n. sp. (Austr.)

RHABDOCYNTHIA*, n. gen.

Body generally smooth. Branchial and atrial apertures 4-lobed.

Test generally rather soft and cartilaginous, containing calcareous spicules.

Mantle also containing calcareous spicules developed in connective-tissue sheaths.

Branchial sac with six or more folds on each side. The chief vessels contain calcareous echinated spicules.

Tentacles compound.

Dorsal lamina toothed.

There are about a dozen species in this genus, and they may be separated as follows:—

- { Branchial sac with 6 folds on each side 1
More than 6 folds on each side 2
- 1 { Surface smooth, test gelatinous, colour whitish.
R. mollis, n. sp. (Austr.)
Surface corrugated, test leathery, colour dark brown.
R. sacciformis, v. Dr. (Jap.)
- 2 { Test transparent or semitransparent 3
Test not at all transparent 4
- 3 { 7 folds on each side 5
8 folds on each side *R. mauritiana*, v. Dr. (Ind. O.)
- 5 { Body elongated; colour greenish brown.
R. subfusca, n. sp. (Austr.)
Body rounded, flattened; colour whitish.
R. tenuis, n. sp. (Austr.)
- 4 { Test soft, cartilaginous 6
Test not soft or cartilaginous 7
- 6 { Test thin, surface roughish *R. papietensis*, Herdm. (Pac.)
Test thick, surface smooth *R. complanata*, Herdm. (Austr.)
- 7 { Animal barrel-shaped; colour red ... *R. rosea*, Sluit. (Mal.)
Not barrel-shaped; colour grey or yellowish white 8
- 8 { Shape pyriform *R. pyriformis*, Rathke. (Pac., Atl.)
Shape oblong, with a broad base, 8 folds on each side.
R. pallida, Heller. (Pac., Atl., W.
[Ind., Ind. O.)
do., var. *billitonensis*, Sluit. (Mal.)

* If this is exactly the genus for which Lahille, in 1887, proposed the name *Herdmania* (Assoc. Franç.), then *Rhabdocynthia* must give way to that prior designation.

CYNTHIA *, *Savigny*, 1816.

Body attached, sessile or very shortly stalked, rarely incrustated with sand. Branchial and atrial apertures both 4-lobed.

Test coriaceous, rarely cartilaginous; no spicules.

Mantle well-developed, usually with a strong musculature.

Branchial sac with 6 to 12 longitudinal folds on each side. No spicules in walls of vessels.

Dorsal lamina a plain membrane, or with the free margin toothed, or represented by a series of dorsal languets.

Tentacles always compound.

Intestine forming rather a wide loop, on the left side.

Gonads on both sides, the left in the intestinal loop.

{ Branchial folds only slightly developed.	
{ Branchial folds all well developed <i>C. irregularis</i> , Herdm. (Austr.)	
1 {	1
Body pedunculated	2
Body sessile	3
2 {	4
Test thick and tough	4
Test thin and leathery	5
4 {	
Surface sulcated <i>C. cerebriformis</i> , Herdm. (Austr.)	
Surface incrustated with sand and hairs. <i>C. japonica</i> , Traust. (Jap.)	
5 {	
Surface smooth, with silky spines ... <i>C. formosa</i> , Herdm. (Austr.)	
Surface not smooth, having knobs and warts.....	6
6 {	
Mantle thin, muscles weak; tentacles 50.	
Mantle strong and muscular; tentacles less than 30	7
7 {	
Dorsal lamina having languets the entire length	8
Dorsal lamina having languets only at posterior end.	
<i>C. Roretzii</i> , v. Dr. (Jap.)	
8 {	
Meshes very much elongated transversely; tentacles 25-30; apertures fringed with bristles	
Meshes not elongated; tentacles 16-20. <i>C. papillosa</i> , L. (Med., N. Atl.)	
<i>C. stolonifera</i> , Heller. (S. Atl.)	
3 {	
Test more or less covered with sand	9
Test free from sand	10
9 {	
Body free	
Body attached	11
11 {	
Body columnar, with remarkable pad-like thickening of test anteriorly. <i>C. preputialis</i> , Heller. (Austr.)	
Body not columnar, and with no such thickening.	
<i>C. jacatrensis</i> , Sluit. (Mal.)	
10 {	
Test provided with remarkable long branched spines	12
Test with no such branched spines.....	13

* *Halocynthia*, Verrill, is merely a synonym.

12	{ Dorsal lamina a plain membrane ... <i>C. echinata</i> , L. (N. Atl.)	
	{ With two rows of small languets ... <i>C. Hilgendorffii</i> , Traust. (Jap.)	
13	{ Languets confined to posterior end, 6 branchial folds. [Med.]	
	{ <i>C. dura</i> , Heller. (Atl., Pac., &	
	{ Languets along the whole length of dorsal lamina	14
14	{ Not more than 6 folds on each side of the branchial sac	15
	{ More than 6 folds on each side	16
15	{ Reproductive organs in the form of numerous small scattered masses	
	{ attached to mantle <i>C. corallina</i> , Roule. (Med.)	
	{ Reproductive organs not broken up into numerous separate masses ...	17
17	{ Intestinal loop narrow <i>C. lævigata</i> , Heller. (W. Ind.)	
	{ Intestinal loop wide	18
18	{ Test thin.....	19
	{ Test not thin	20
19	{ Surface smooth <i>C. clavigera</i> , Traust. (S. Atl.)	
	{ Surface not smooth	21
21	{ Branchial siphon with a strong muscle-band at its base and armed	
	{ with spines <i>C. nodulosa</i> , v. Dr. (W. Ind. ?)	
	{ Branchial siphon not provided with this armature	22
	{ [& Med.]	
22	{ Inner surface of test white, soft..... <i>C. squamulosa</i> , Ald. (N.W. Eur.	
	{ Inner surface not white, nor soft.....	23
23	{ Internal longitudinal bars regular, 13-15 on a fold, 7 stigmata in mesh.	
	{ <i>C. Riisiana</i> , Traust. (W. Ind.)	
	{ Internal longitudinal bars irregular, 5 or 6 stigmata in mesh.	
	{ <i>C. haustor</i> , Stimps. (N. Pac.)	
20	{ Tentacles 20-30, test smooth	24
	{ Tentacles 12, test rough <i>C. fissa</i> , Herdm. (Austr.)	
24	{ Apertures inconspicuous, far apart . <i>C. gangelion</i> , Sav. (Red S.)	
	{ Apertures conspicuous <i>C. arcuata</i> , Heller. (Austr.)	
16	{ Test cartilaginous, smooth	25
	{ Test coriaceous and rough	26
	{ More than 10 folds on each side of branchial sac.	
25	{ <i>C. hispida</i> , Herdm. (Austr.)	
	{ Not more than 9 folds on each side	27
27	{ Mantle semitransparent, tentacles 12. <i>C. momus</i> , Sav. (Med., Red S., Atl.)	
	{ Mantle opaque, tentacles 24-28, 7 branchial folds on each side.	
	{ <i>C. panter</i> , Sav. (Red S.)	
26	{ Not more than 10 branchial folds on each side.....	28
	{ 12 or 13 folds on each side..... <i>C. grandis</i> , Heller. (Austr.)	
28	{ Apertures at opposite ends of body . <i>C. mirabilis</i> , v. Dr. (Jap.)	
	{ Apertures not distant	29
29	{ Body oblong, erect, long axis antero-posterior.	
	{ <i>C. Nordenskiöldii</i> , Wagn. (Arct.)	
	{ Body rounded, or quadrangular with long axis transverse	30
30	{ Body rounded, mamillated, red, siphons striped with orange.	
	{ <i>C. morus</i> , Forb. (N.W. E. & Med.)	
	{ Body not rounded and not red	31
31	{ Body ovoid or retort-shaped <i>C. scutellata</i> , Heller. (Med.)	
	{ Body quadrangular <i>C. galbana</i> , n. sp. (Austr.)	

For insufficiently described forms see p. 585.

FORBESELLA, n. gen.

Body attached, depressed.

Test firm, modified to form scales or plates.

Branchial sac with only 4 folds on each side, or even only 3 on the left side.

Tentacles compound.

This genus is formed for the reception of the remarkable little "*Cynthia tessellata*" of E. Forbes, which differs from all other known *Cynthiinae* and agrees with the *Styelinae* (from which again it differs in having compound tentacles) in having not more than 4 folds on each side of the branchial sac. The "*Cynthia limacina*" of Forbes is either the same species or very closely related to it, and probably therefore comes also into this genus.

The single sufficiently known species is then

Forbesella tessellata, Forb. (N.W. Eur.)

Subfamily STYELINÆ, *Herdman*, 1881.

Body attached, sessile, rarely incrustated with sand. Branchial and atrial apertures either 4-lobed or irregular.

Test usually coriaceous, rarely cartilaginous.

Branchial sac with at most four folds upon each side.

Tentacles simple, unbranched.

Alimentary canal with a well-marked stomach and no distinct glandular cæcum or "liver."

Gonads in the form of one or a few elongated tubes, or a large number of small scattered masses ("polycarps") attached to the inner surface of the mantle.

This subfamily includes 8 genera*, which may be distinguished as follows:—

	{	Branchial sac absent †	Styeloides.	1
		Branchial sac present		
1	{	Branchial sac with no folds	Pelonaia.	2
		Branchial sac with folds		
2	{	Branchial sac with no stigmata in the meshes	Bathyoncus.	3
		Branchial sac with stigmata in the meshes.....		
3	{	With only a single fold in the branchial sac	Styelopsis.	4
		With more than one fold in the branchial sac		

* *Alderia*, proposed by Lahille in 1887, cannot be conveniently separated from *Styela*.

† This is such an exceptional and remarkable case that I cannot help suspecting that the single specimen examined by Sluiter was merely an individual abnormality.

4	{ With a single gonad, placed on the right side	Dendrodoa.	5
	{ With gonads on both sides		
5	{ Stigmata curved	Glandula.	6
	{ Stigmata straight		
6	{ Gonads few, elongated, tubular	Styela.	
	{ Gonads numerous, small "polycarps"	Polycarpa.	

STYELOIDES, *Sluiter*, 1885.

Branchial sac entirely absent.

Tentacles simple.

Alimentary canal absent.

This includes a single species, *Styeloides abranchiata*, a remarkable form found by Sluiter near the island of Billiton in the Malay Archipelago.

PELONAIIA, *Forbes and Goodsir*, 1841.

Body cylindrical, elongated, unattached. Apertures anterior, not lobed.

Test coriaceous, wrinkled, partly incrustated with sand.

Branchial sac with no folds.

This genus includes two forms which may be separate species, viz. :—

Body much elongated ; surface rough, wrinkled, deep brown.

P. corrugata, Forb. (N.W. Eur.)

Not so much elongated ; surface smooth, pilose, greenish yellow.

P. glabra, Forb. & Goods. (N.W. Eur.)

BATHYONCUS, *Herdman*, 1882.

Body ovate or discoid, sessile, attached ; apertures inconspicuous.

Test membranous and thin.

Branchial sac with several slight folds on each side ; meshes square, no stigmata nor fine longitudinal vessels.

Dorsal lamina a plain membrane.

Tentacles simple.

Alimentary canal on the left side.

Gonads a single elongated mass or several small masses attached to the mantle on each side.

This is a very remarkable and entirely deep-sea genus. It contains three species, all obtained during the 'Challenger' Expedition, and all from very deep water, viz. 1600, 2300, and 3125 fathoms, the latter being the greatest depth, I believe, from which Ascidians have ever been obtained.

The three species may be separated as follows :—

- | | | |
|---|--|---|
| | { With one large fold on left side of branchial sac; body ovate. | |
| | <i>B. mirabilis</i> , Herdm. (Southern Oc.) | |
| | { With small folds only | 1 |
| 1 | { Body discoid | <i>B. discoideus</i> , Herdm. (N. Pac.) |
| | { Body globular | <i>B. minutus</i> , Herdm. (N. Pac.) |

STYELA, *MacLeay*, 1824.

Body attached, sessile, rarely pedunculated, sometimes incrustated with sand. Apertures both 4-lobed.

Test usually thin, coriaceous.

Branchial sac with 4, or fewer, folds on each side.

Dorsal lamina usually with a plain margin.

Tentacles simple, unbranched.

Alimentary canal forming a narrow loop.

Gonads on both sides of the body. Ovaries in the form of elongated sausage-like bodies.

The known species of *Styela* may be arranged as follows :—

- | | | |
|----|--|---------------------------------------|
| | { Branchial folds partly rudimentary..... | 1 |
| | { Branchial folds all well developed | 2 |
| 1 | { Dorsal lamina plain | 3 |
| | { Dorsal lamina not a plain membrane..... | 4 |
| 3 | { Two or 3 distinct branchial folds on each side | 5 |
| | { Four slight folds on each side | 6 |
| 5 | { Colour cream-white; test thick but soft, scaly. | |
| | <i>S. squamosa</i> , Herdm. (A. Arct.) | |
| | { Colour dark brown; test tough, wrinkled. | |
| | <i>S. pusilla</i> , Herdm. (N. Pac.) | |
| 6 | { Body flattish, longer than high | <i>S. humilis</i> , Heller. (S. Pac.) |
| | { Body acorn-shaped, as high as long. <i>S. glans</i> , Herdm. (S. Atl.) | |
| 4 | { Margin of dorsal lamina crumpled | 7 |
| | { Margin of dorsal lamina notched and toothed. | |
| | <i>S. flava</i> , Herdm. (S. Atl.) | |
| 7 | { Atrial aperture far back; surface covered with silky hairs. | |
| | <i>S. sericata</i> , Herdm. (A. Arct.) | |
| | { Atrial aperture anterior; surface rough and slightly sandy, no hairs. | |
| | <i>S. oblonga</i> , Herdm. (S. Atl.) | |
| 2 | { Body covered with sand | 8 |
| | { Body not covered with sand..... | 9 |
| 8 | { More or less sandy all over | 10 |
| | { Sand confined to posterior half | <i>S. bicolor</i> , Sluit. (Mal.) |
| 10 | { Individuals aggregated in clusters, test coriaceous. | |
| | <i>S. racemosa</i> , n. sp. (Austr.) | |
| | { Individuals not aggregated, test rather cartilaginous*. | |
| | <i>S. exigua</i> , Herdm. (Austr.) | |

* Here also *Styela perforata* and *Styela Traustedti*, both from the Malay Archipelago, the description of which by Sluiter has reached me since this table was in type, find their place; they can be readily distinguished from *S. exigua*.

9	{	Body on a well-marked peduncle	11
	{	Body sessile	12
11	{	Peduncle slender, meshes with 6 or more stigmata. <i>S. clava</i> , Herdm. (N. Pac.)	
	{	Peduncle not very slender, meshes with only 2 stigmata. <i>S. gelatinosa</i> , Traust. (Arct.)	
12	{	Languets present	<i>S. bythia</i> , Herdm. (A. Arct.)
	{	Dorsal lamina a plain membrane	13
13	{	Test with hair-like prolongations from surface.....	14
	{	Test with no such prolongations.....	15
14	{	Black on surface, hairs few and large. <i>S. solearis</i> , Sav. (Red S.)	
	{	Grey, hairs small and felted	<i>S. cinerea</i> , Sav. (Red S.)
15	{	Dorsal tubercle large and complicated. <i>S. mytiligera</i> , Sav. (Red S.)	
	{	Dorsal tubercle not large nor complicated.....	16
16	{	Very many stigmata in a mesh	17
	{	Meshes not exceedingly elongated	18
17	{	Body pyriform, apertures with more than 4 lobes. <i>S. grandis</i> , Herdm. (A. Arct.)	
	{	Body barrel-shaped, apertures, 4-lobed. <i>S. lactea</i> , Herdm. (A. Arct.)	
18	{	Individuals aggregated.....	19
	{	Individuals not aggregated	20
19	{	Surface sulcated, of a white colour... <i>S. plicata</i> , Les. (Cosmop.) (= <i>S.</i>	
	{	Surface not sulcated, of a reddish colour. [<i>gyrosa</i> , Hell.)	
		<i>S. aggregata</i> , O.F.M. (N.W.Eur.)	
20	{	Stigmata 3 in a mesh	<i>S. convexa</i> , Herdm. (A. Arct.)
	{	Stigmata more than 3 in a mesh.....	21
21	{	Meshes not divided transversely	22
	{	Meshes divided transversely	23
22	{	Body broad (dorso-ventrally).....	<i>S. scortea</i> , n. sp. (Austr.)
	{	Body long (antero-posteriorly)	<i>S. radicata</i> , Herdm. (Austr.)
23	{	Colour pale yellowish grey, siphons violet inside. <i>S. canopus</i> , Sav. (Red S.)	
	{	Colour red, siphons not violet inside. <i>S. canopoides</i> , Heller. (Med.)	

For imperfectly known species, see p. 585.

STYLOPSIS, *Traustedt*, 1882.

Body globular or cylindrical, attached, not incrustated with sand. Apertures both 4-lobed.

Branchial sac with the folds reduced to a single one placed near the dorsal edge of the right side, the other 7 being quite rudimentary.

Gonads on the right side only.

This genus was formed for the reception of the single species *Stylopsis grossularia*, Van Beneden, common on the north-western shores of Europe.

DENDRODOA, *MacLeay*, 1824.

Body subcylindrical, attached, not sandy. Apertures minute, on anterior end.

Test coriaceous.

Branchial sac with 4 folds on each side.

Tentacles simple.

Alimentary canal on left side, stomach grooved, intestinal loop narrow.

Gonads forming a single branched mass placed on the right* side of the body on the inner surface of the mantle.

This genus contains the single species *Dendrodia glandaria*, MacLeay, from Winter Island (Arct.).

GLANDULA, *Stimpson*, 1852.

Body free, globular, sandy. Branchial and atrial apertures both 4-lobed.

Branchial sac with 4 folds on each side. Stigmata curved and arranged in elliptic groups round centres which are placed in longitudinally-running rows.

Dorsal lamina plain-edged.

Tentacles simple.

Alimentary canal on the left side.

Gonads forming 5 long masses on the right and 3 on the left side.

This genus, which comes close to *Styela*, but differs from it in having the stigmata curved, has had the following three species placed in it; but they require re-examination, and may possibly prove to belong to one and the same species:—

G. mollis, Stimpson. (E. N. Am.)

G. fibrosa, Stimps. (E. N. Am.)

G. arenicola, Verrill. (E. N. Am.)

POLYCARPA, *Heller*, 1877.

Body attached, usually sessile, rarely pedunculated, sometimes incrustated with sand. Both apertures usually 4-lobed.

Test usually coriaceous.

Branchial sac with 4 folds, or less than 4, on each side.

Dorsal lamina with a plain margin.

Tentacles simple.

Alimentary canal forming a wide loop.

Reproductive organs in the form of a number of small separate

* "Left" in MacLeay's description (Trans. Linn. Soc. vol. xiv. p. 548), as he described the animal in the reversed position.

masses ("polycarps") scattered over the inner surface of the mantle.

The known species of *Polycarpa* * may be arranged thus:—

	Branchial sac with folds rudimentary	1
	Branchial sac with folds well developed	2
	Test very thin, 2 bars on each fold, 6-8 stigmata. <i>P. minuta</i> , Herdm. (A. Arct.)	
1	Test thick, bars on fold numerous, 1-4 stigmata. <i>P. quadrata</i> , Herdm. (Mal.)	
2	Less than 4 folds on each side.....	
	At least 4 folds on each side	4
3	With 2 folds on each side <i>P. simplex</i> , n. sp. (Austr.) [Med.]	
	With 3 on right side and 2 on left. <i>P. glomerata</i> , Ald. (N.W.Eur.,	
4	With 5 folds on right side and 4 on left	5
	With 4 folds on each side.....	6
	Test thick; one horn of dorsal tubercle turned out. <i>P. spongiabilis</i> , Traust. (W. Ind.)	
5	Test thin, pellucid; both horns of dorsal tubercle turned in. <i>P. obtecta</i> , Traust. (W. Ind.)	
6	Branchial sac papillated on inner surface	7
	No papillæ on interior of branchial sac	8
7	Tentacles 25, stigmata normal ... <i>P. papillata</i> , Sluit. (Mal.)	
	Tentacles 40, stigmata small round apertures. <i>P. Herdmani</i> , Sluit. (Mal.)	
8	Body pedunculated	9
	Body sessile	10
9	Individuals aggregated in masses. <i>P. nigricans</i> , Heller. (Ind. O.)	
	Individuals not aggregated	11
11	5-12 stigmata in a mesh	12
	13 or 14 stigmata in a mesh <i>P. spiralis</i> , Sluit. (Mal.)	
12	Peduncle almost as long as body	13
	Peduncle much shorter than body	14
	Apertures conspicuous, branchial anterior, atrial dorsal, lobes distinct. <i>P. pedata</i> , Herdm. (Mal.)	
13	Apertures inconspicuous, both anterior, lobes indistinct. <i>P. radicata</i> , Herdm. (Austr.)	
14	More than 65 tentacles <i>P. viridis</i> , Herdm. (Austr.)	
	Fewer than 50 tentacles	15
15	Body roundish, attached posteriorly by branching roots, some adhering sand <i>P. pedunculata</i> , Heller. (Austr.)	
	Body longish, no adhering roots, surface almost smooth.....	16
	Mantle thin, muscles weak, dorsal lamina wide, anterior part sinuous. <i>P. oligocarpa</i> , Sluit. (Mal.)	
16	Mantle thick, muscles strong, dorsal lamina smooth and straight. <i>P. elata</i> , Heller. (Austr. & Mal.)	
10	Body all covered with sand	17
	Body not sandy, or only partially covered	18
	4-6 bars on a fold, 1 or 2 in the interspace. <i>P. pusilla</i> , Herdm. (N.W. Eur.)	
17	6-9 bars on a fold, 6-8 in the interspace	19

* *Styela psoloessa*, *S. aurita*, *S. argentata*, and *S. olitoria*, recently described by Sluiter from the Malay Archipelago, too late for insertion in the table, fall into this genus according to my definitions.

19	{ 2 or 3 stigmata in a mesh <i>P. procera</i> , Sluit. (Mal.)	20
	{ 4-10 stigmata in a mesh	
20	{ Siphons very long <i>P. longisiphonica</i> , Herdm. (Austr.)	21
	{ Siphons not unusually long.....	
21	{ Test prolonged into branched hair-like processes.....	22
	{ Test not provided with these processes or fibres	23
22	{ Apertures close, conspicuous, yellow speckled with red. <i>P. comata</i> , Ald. (N.W. Eur.)	
	{ Apertures distant, inconspicuous, dark brown colour. <i>P. molguloides</i> , Herdm. (Austr.)	
23	{ Individuals very small, like pellets of sand. <i>P. pilella</i> , Herdm. (S. Atl.)	
	{ Individuals not small	24
24	{ Test having processes for attachment; tentacles 16-20. <i>P. sabulosa</i> , Heller. (Med.)	
	{ No processes of test for attachment present	25
25	{ Atrial aperture at anterior end ... <i>P. tinctor</i> , Q. & G. (Austr.)	
	{ Atrial aperture at posterior end... <i>P. Stimpsoni</i> , Heller. (Austr.)	
18	{ Dorsal lamina a plain membrane	26
	{ Dorsal lamina not a plain membrane.....	27
27	{ Dorsal lamina ribbed only in the anterior part. <i>P. captiosa</i> , Sluit. (Mal.)	
	{ Dorsal lamina with partial ribs along the entire length. <i>P. formosa</i> , Herdm. (N. Atl.)	
26	{ Tentacles numerous, 60 or more	28
	{ Tentacles not numerous, 40 or less.....	29
28	{ Dorsal tubercle irregularly horseshoe-shaped, one horn turned out. <i>P. rugosa</i> , v. Dr. (S. Atl.)	
	{ Dorsal tubercle nearly circular, horns turned in. <i>P. pomaria</i> , Sav. (N.W. Eur.)	
29	{ Body free, covered with sand, &c.	30
	{ Body attached, test exposed or only partially incrustated	31
30	{ Surface smooth, regular, fine sand grains; colour yellow-brown. <i>P. curta</i> , Herdm. (N. Atl.)	
	{ Surface rough, irregular, stones &c. attached; colour dull yellow. <i>P. monensis</i> , Herdm. (N.W. Eur.)	
31	{ Test cartilaginous, with bladder-cells. <i>P. ascidioides</i> , n. sp. (Austr.)	
	{ Test not cartilaginous, no bladder-cells	32
32	{ Test quite black.....	33
	{ Test not black	34
33	{ Fixed by shaggy fibres, foreign matter attached. <i>P. obscura</i> , Heller. (Austr.)	
	{ Test with no fibres, surface free from foreign matter. <i>P. cryptocarpa</i> , Sluit. (Mal.)	
34	{ Body discoid, flattened antero-posteriorly, tentacles 16. <i>P. discoidea</i> , Heller. (Med.)	
	{ Body not flattened antero-posteriorly.....	35
35	{ Surface nearly smooth	36
	{ Surface irregular and crumpled, or mamillated	37
36	{ Shape ball-like <i>P. tumida</i> , Heller. (W. Ind.)	
	{ Shape not ball-like	38
38	{ Posterior end narrow	39
	{ Posterior end broad and rounded	40

40	{ Alimentary canal forms a very wide loop, open dorsally. <i>P. patens</i> , Sluit. (Mal.)	
	{ Alimentary canal not forming a wide loop. <i>P. Haddoni</i> , n. sp. (Austr.)	
39	{ Colour dark, though not black ... <i>P. nebulosa</i> , Heller. (Austr.)	
	{ Colour light, yellowish or greyish white	41
41	{ Anus fringed, stomach ovate <i>P. argoensis</i> , Herdm. (N.W. Eur.)	
	{ Anus not fringed, stomach elliptical. <i>P. gracilis</i> , Heller. (Med.)	
37	{ Test tough and leathery	42
	{ Test soft, may be thick	43
43	{ Dorsal tubercle spongy and irregular. <i>P. sulcata</i> , Herdm. (Mal.)	
	{ Dorsal tubercle not spongy, normal	44
44	{ Dorsal tubercle circular in outline. <i>P. mollis</i> , Heller. (?)	
	{ Dorsal tubercle irregularly S-shaped. <i>P. elongata</i> , n. sp. (Austr.)	
42	{ Tentacles all one length	
	{ Tentacles of different lengths	45
45	{ Meshes divided by a horizontal vessel	46
	{ Meshes not divided horizontally.....	47
47	{ Stigmata 6-8 in a mesh	48
	{ Stigmata 10-12 in a mesh <i>P. Bassi</i> , Herdm. (Austr.)	
48	{ Test thick and tough	49
	{ Test thin <i>P. torresiana</i> , n. sp. (Austr.)	
49	{ Colour dirty yellowish white..... <i>P. irregularis</i> , Herdm. (Mal.)	
	{ Colour dark purplish brown	50
50	{ Inner surface of mantle with minute brown pigment-spots. <i>P. ænea</i> , n. sp. (Austr.)	
	{ Inner surface of mantle without pigment-spots. <i>P. fulva</i> , n. sp. (Austr.)	
46	{ Siphons prominent and conspicuous	51
	{ Siphons not prominent or conspicuous	52
51	{ Test thin; stigmata 7-8 in a mesh. <i>P. Mayeri</i> , Traust. (Med.)	
	{ Test thick and opaque; stigmata 3 in a mesh. <i>P. aspera</i> , Herdm. (S. Atl.)	
52	{ Body cylindrical, colour red <i>P. rustica</i> , Linn. (N.W. Eur.)	
	{ Body not cylindrical, colour brownish	53
53	{ Inner surface of test pearly grey-white; stigmata 10-12 in a mesh. <i>P. varians</i> , Heller. (Med.)	
	{ Inner surface of test light brown, with dark specks; stigmata 7-9 in a mesh <i>P. fastigata</i> , n. sp. (Austr.)	

The following species of Cynthiidae have been so insufficiently described that it is impossible to say with certainty which genera they belong to:—

- Cynthia quadrangularis*, Forb. (N.W. Eur.)
C. informis, Forb. (N.W. Eur.)
C. limacina, Forb. (N.W. Eur.) [? *Forbesella*.]
C. mammillaris, Pallas. (N.W. Eur.)
C. ampulla, Brug. (N.W. Eur., Med.)

- C. tuberosa* *, Macg. (N.W. Eur., Med.)
C. sabulosa, Stimps. (Austr.) [Styelinae.]
C. partita, Stimps. (E. N. Am.)
C. ovalis. (?)
C. violacea, Ald. (N.W. Eur.)
C. coriacea, Ald. & Hanc. (N. W. Eur.)
C. sulcatula, Ald. (N.W. Eur.)
C. granulata, Ald. (N.W. Eur.)
C. monoceros, Möll. (E. N. Am.)
C. carnea, Ag. (E. N. Am.)
C. stellifera, Verr. (E. N. Am.)
C. pulchella, Verr. (E. N. Am.)
C. opalina, Ald. (N.W. Eur.)
C. glacialis. (?)
C. angularis, Stimps. (S. Atl.)
C. lævissima, Stimps. (Austr.) [Cynthiinae.]
C. dumosa, Stimps. (Austr.) [Cynthiinae.]
C. satsumensis, Stimps. (Japan.)
C. delicatula, Stimps. (? Japan.)
C. ocellifera, Stimps. (China.)
C. gemmata, Stimps. (China.)
C. araneosa, Stimps. (China.)
C. pupa, Sav. (Red S.) [Microcosmus?]
C. rosea, Ald. (N.W. Eur.)
Styela pupa, Heller. (S. Atl.)
S. areolata, Heller. (Ind. O.)
S. lineata, Beck. (Arct.)
S. variabilis. (?)
S. fibrillata. (?)

Family III. ASCIDIIDÆ, *Herdman*, 1880.

Body attached, usually sessile, rarely pedunculated. Branchial aperture usually 8-lobed, atrial usually 6-lobed.

Test gelatinous or cartilaginous, rarely chitineous or horny.

Branchial sac without folds. Internal longitudinal bars present and usually papillated. Stigmata straight or curved.

Tentacles simple, filiform.

Alimentary canal either at one side of the branchial sac (usually the left) or extending beyond it posteriorly.

Gonads placed close to the intestine.

There are four subfamilies—the Corellinae, the Hypobythiinae, the Ascidiinae, and the Cioninae.

* This species is described as having 6 folds on each side of the branchial sac, and simple tentacles.

Subfamily CORELLINÆ, *Herdman*, 1882.

Body attached, sessile or pedunculated. Branchial aperture with 8, 6, or no lobes.

Test cartilaginous, gelatinous or horny.

Branchial sac provided with internal longitudinal bars. Stigmata curved.

Alimentary canal usually on right side or dorsal edge of branchial sac.

This subfamily contains 3 genera which may be separated as follows:—

- | | | | | |
|---|---|---|----------------------|---|
| 1 | { | Test modified to form horny (chitinous) plates ... | Chelyosoma. | 1 |
| | | Test soft and gelatinous or cartilaginous | | |
| | | Body sessile; viscera on right side of branchial sac | Corella. | |
| | | Body pedunculated; viscera on dorsal edge of branchial sac. | Corynascidia. | |

CHELYOSOMA, *Brod. & Sow.*, 1829.

Body flattened antero-posteriorly, depressed and attached. Branchial and atrial apertures both 6-lobed.

Test modified on the upper surface to form polygonal horny plates, definite in shape and position.

Branchial sac with curved stigmata.

Dorsal lamina represented by languets.

Alimentary canal on left side of branchial sac.

Gonads forming a network over the intestinal loop.

There are two known species:—

With the test of the upper surface divided into 8 plates.

C. Macleayanum, *Brod. & Sow.* (Atl., Arct., Pac.)

With the test of the upper surface divided into 14 plates.

C. productum, *Stimps.* (N. Pac.)

CORYNASCIDIA, *Herdman*, 1882.

Body elongated, pyriform, pedunculated. Apertures not lobed.

Test gelatinous or membranous.

Branchial sac extremely delicate. Internal longitudinal bars present, but not provided with papillæ. Interstigmatic vessels and stigmata coiled spirally.

Dorsal lamina represented by languets.

Tentacles simple, filiform.

Alimentary canal on dorsal edge of branchial sac, running antero-posteriorly.

Gonads forming a mass placed on the posterior end of stomach.

This genus contains the single 'Challenger' species *Corycidia Suhmi*, Herdman, of which specimens were obtained in the South Pacific from a depth of 2160 fms., and in the Antarctic from a depth of 1375 fms.

CORELLA, Alder & Hancock, 1870.

Body attached, occasionally free, sessile. Branchial aperture 8-lobed, atrial 6-lobed.

Test gelatinous or cartilaginous, but soft and semitransparent.

Branchial sac with no papillæ on its internal longitudinal bars. Stigmata curved and placed in the walls of regularly arranged infundibula; interstigmatic vessels spirally coiled.

Dorsal lamina represented by languets.

Tentacles simple.

Alimentary canal on the right side of the branchial sac.

Gonads forming a network round the median part of the intestine.

The species of *Corella* are as follows:—

	{	Atrial aperture anterior	1
		Atrial aperture dorsal	2
1	{	Atrial aperture placed on a very long projection. <i>C. larvæformis</i> , Hanc. (N.W. Eur.)	
		Atrial aperture sessile, or on a short siphon	3
3	{	Musculature strong on left side... <i>C. parallelogramma</i> , O.F.M. (N.W. Eur., Med.)	
		Musculature very weak on both sides. <i>C. minuta</i> , Traust. (W. Ind.)	
2	{	Anterior end wide, atrial aperture not far from branchial. <i>C. ovata</i> , Hanc. (N.W. Eur.)	
		Anterior end narrow, atrial aperture distant from branchial.....	4
4	{	Tentacles of more than one size	5
		Tentacles all of one size <i>C. japonica</i> , Herdm. (Pac., Mal.)	
5	{	Tentacles 50	6
		Tentacles over 100 <i>C. novaræ</i> , v. Dr. (Ind. O.)	
6	{	Tentacles of 2 sizes, dorsal tubercle horseshoe-shaped. <i>C. eumyota</i> , Traust. (S. Atl.)	
		Tentacles of 3 sizes, dorsal tubercle semilunar. <i>C. borealis</i> , Traust. (Arct.)	

Subfamily HYPOBYTHIINÆ, Herdman, 1882.

Body pedunculated, fixed. Apertures not lobed.

Test gelatinous or cartilaginous.

Branchial sac with no internal longitudinal bars. Stigmata small and irregular.

Viscera on dorsal edge of branchial sac.

This group contains the single genus *Hypobythius*.

HYPOBYTHIUS, *Moseley*, 1876 [& *Herdman*, 1882].

Body cup-shaped or pyriform, pedunculated, attached. Apertures circular, not lobed.

Test cartilaginous, but soft and thin, thickened in places to form plates.

Branchial sac not folded, and with no internal longitudinal bars. Stigmata small, rounded, and irregularly placed.

Dorsal lamina a plain membrane.

Viscera forming a compact elongated mass on the dorsal edge of the branchial sac.

This remarkable deep-sea genus contains two species, obtained during the 'Challenger' Expedition from depths of 2900 and 600 fms.:—

Body on a long peduncle; test thickened to form many rounded nodules or plates..... *H. calycodes*, Mos. (N. Pac.)

Body on a short peduncle; test only thickened to form a single plate on dorsal edge *H. Moseleyi*, Herdm. (S. Atl.)

Subfamily ASCIDIINÆ, *Herdman*, 1882.

Body usually attached by left side or posterior end. Branchial aperture with at least 8 lobes; atrial with at least 6 lobes.

Test gelatinous or cartilaginous.

Mantle with the musculature forming an irregular network, which is strongest on the right side.

Viscera on the left side of the branchial sac.

Branchial sac provided with internal longitudinal bars. Stigmata straight.

Dorsal lamina usually a plain membrane, rarely languets (*Abyssascidia*).

This subfamily contains 5 genera, as follows:—

{	Dorsal lamina present as a membrane	1
	Dorsal lamina represented by languets	Abyssascidia.
1 {	Branchial sac recurved posteriorly	Phallusia.
	Branchial sac straight	2
2 {	Nerve-ganglion close to dorsal tubercle	Ascidiella.
	Ganglion distant from dorsal tubercle	3
3 {	Test very hard, thick and stiff	Pachychlæna.
	Test soft and flexible	Ascidia.

PHALLUSIA (*Sav.*, 1816), *Roule*, 1884.

Body erect, attached.

Test cartilaginous.

Branchial sac with its posterior part recurved upon itself.

Nerve-ganglion and neural gland distant from the dorsal tubercle.

Dorsal lamina extending behind the œsophageal aperture.

Renal concretions always enclosed in the intestinal wall, and never extending into the mantle.

This contains the single well-known species *P. mammillata*, Cuv. (N.W. Eur., Med.).

ASCIDIELLA, Roule, 1884.

Body attached by posterior end or left side, not incrustated with sand. Branchial and atrial apertures not far distant.

Branchial sac with no intermediate papillæ on the internal longitudinal bars; not folded on itself posteriorly. Transverse vessels of two sizes, placed alternately.

Nerve-ganglion and subneural gland placed close behind the dorsal tubercle.

Dorsal lamina not continued posterior to the œsophageal aperture.

Renal concretions extending into the left side of the mantle as well as the intestinal wall.

The known species of *Ascidella** may be separated as follows:—

{		Branchial sac with papillæ	1
{		No papillæ in branchial sac	2
1	{	With a very wide open intestinal loop. <i>A. archaia</i> , Sluit. (Mal.)	
		With the usual narrow intestinal loop. <i>A. venosa</i> , O. F. M. (N.W. Eur., Med.)	
2	{	Fixed by a posteriorly placed peduncle. <i>A. lutaria</i> , Roule. (Med.)	
		Not fixed by a posterior peduncle	3
3	{	Body triangular, wide posteriorly, narrow anteriorly. <i>A. triangularis</i> , Herdm. (N.W. Eur.)	
		Body nearly cylindrical or ellipsoidal	4
4	{	Dorsal lamina with a plain edge. <i>A. virginea</i> †, O. F. M. (N.W. E., Med.)	
		Dorsal lamina with the edge toothed or irregular	5

* Some of the older species of *Ascidia* which have not been re-investigated lately may belong to this genus. I place here provisionally the remarkable *Ascidia archaia* described lately by Sluiter from the Malay Archipelago. The position of the ganglion is not known. "*Phallusia scabroides*," named by Ed. Van Beneden and Julin, but not yet sufficiently described, appears to belong to this genus.

† The *Ascidia sordida* of Alder & Hancock.

11	{ Dorsal tubercle very small. <i>A. Salvatoris</i> *, Traust. (Med.)	
	{ Dorsal tubercle large..... <i>A. glacialis</i> , Traust. (Arct.)	
9	{ Transverse vessels alternately large and small. <i>A. tritonis</i> , Herdm. (N. Atl.)	
	{ Transverse vessels all much same size	12
12	{ Transverse vessels slender, apertures both anterior. <i>A. cylindracea</i> , Herdm. (Austr.)	
	{ Transverse vessels wide, atrial aperture some way back. <i>A. nodosa</i> , Sluit. (Mal.)	
8	{ Intermediate papillæ present. <i>A. tenera</i> , Herdm. (S. Atl. & Mag.)	
	{ No intermediate papillæ present.....	13
13	{ Body very much elongated, siphons conspicuous. <i>A. curvata</i> , Traust. (W. Ind.)	
	{ Body not elongated, siphons inconspicuous	14
14	{ Tentacles 20-25 <i>A. despecta</i> , Herdm. (A. Arct.)	
	{ Tentacles 35-40.....	15
15	{ Dorsal tubercle simple, U-shaped. <i>A. exigua</i> †, Herdm. (N.W. Eur.)	
	{ Dorsal tubercle horseshoe-shaped. <i>A. fulcigera</i> , Herdm. (N. Atl.)	
5	{ Plication of the branchial sac very slight	16
	{ Plication strongly marked	17
16	{ Apertures both near centre of upper surface. <i>A. aspera</i> , Heller. (Med.)	
	{ Apertures not in centre, but at dorsal edge. <i>A. muricata</i> , Heller. (Med.)	
17	{ Surface covered with short hairs. <i>A. capillata</i> , Sluit. (Mal.)	
	{ Surface free from hairs	18
18	{ No papillæ on internal longitudinal bars. <i>A. patula</i> , O. F. M. (N.W. Eur.)	
	{ With internal longitudinal bars papillated	19
19	{ Body erect, attached by small area posteriorly	20
	{ Body recumbent, attached by greater part of left side	21
20	{ Prebranchial zone with papillæ	22
	{ Prebranchial zone not papillated	23
22	{ Papillæ of prebranchial zone very large. <i>A. melanostoma</i> , Sluit. (Mal.)	
	{ Papillæ small..... <i>A. prunum</i> , O. F. M. (N.W. Eur. & Med.)	
23	{ Tentacles numerous, 60 or more.....	24
	{ Tentacles not numerous, 25 to 35	25
24	{ Test very dark coloured	26
	{ Test not of a dark colour.....	27
26	{ Intermediate papillæ on the internal longitudinal bars. <i>A. nigra</i> , Sav. (Atl., Red S.)	
	{ No intermediate papillæ on the bars. <i>A. atra</i> , Les. (W. Ind.)	
27	{ Body free, not attached	28
	{ Body attached	29

* This is the *A. oblonga* of Traustedt's former paper.

† This may possibly be the young of some other species.

28	{ Dorsal tubercle irregular, aperture broken up into 4 distinct sections. <i>A. liberata</i> , Sluit. (Mal.)	
	{ Dorsal tubercle normal, aperture not broken up. <i>A. limosa</i> , Sluit. (Mal.)	
29	{ Body pear-shaped.....	<i>A. pyriformis</i> , Herdm. (Austr.)
	{ Body not pear-shaped	30
30	{ Dorsal tubercle semilunar in shape	31
	{ Dorsal tubercle not semilunar.....	32
31	{ Test transparent	<i>A. styeloides</i> , Traust. (W. Ind.)
	{ Test thick and soft, not transparent. <i>A. meridionalis</i> , Herdm. (S. Atl.)	
32	{ Atrial aperture not more than $\frac{1}{4}$ way down body. <i>A. Challengeri</i> , Herdm. (A. Arct.)	
	{ Atrial aperture more than $\frac{1}{4}$ way down body. <i>A. mentula</i> *, O. F. M. (N.W. Eur. & Med.)	
25	{ Dorsal tubercle longer antero-posteriorly than laterally	33
	{ Dorsal tubercle longer laterally than antero-posteriorly	34
34	{ Dorsal tubercle heart-shaped. <i>A. truncata</i> , Herdm. (N.W. Eur.)	
	{ Dorsal tubercle serpentiform. <i>A. translucida</i> †, Herdm. (A. Arct.)	
33	{ Stigmata 2-6 in a mesh... <i>A. fusiformis</i> ‡, Herdm. (N.W. Eur.)	
	{ Stigmata 6-8 in a mesh.....	35
35	{ Test soft, easily torn; stigmata long and narrow. <i>A. placenta</i> , Herdm. (A. Arct.)	
	{ Test not soft; stigmata rather short. <i>A. lata</i> , Herdm. (N.W. Eur.)	
21	{ Body partly incrustated with sand, &c.	36
	{ Body not incrustated with sand	37
36	{ Body of a dull green colour, tentacles about 70. <i>A. plebeia</i> , Ald. (N.W. Eur. & Med.)	
	{ Body not of a green tint, tentacles 10-15. <i>A. caudata</i> , Heller. (S. Atl.)	
37	{ Dorsal lamina with a plain edge	38
	{ Edge of dorsal lamina not plain	39
38	{ Test thick, cartilaginous, opaque, but with no adhering prolongations. <i>A. quadrata</i> , Traust. (Med.)	
	{ Test rather thin and transparent, with prolongations round the area of attachment.....	40
40	{ Siphons long, conspicuous; tentacles 60. <i>A. canaliculata</i> , Heller. (S. Atl. & Mal.)	
	{ Siphons short, wart-like, inconspicuous; tentacles 40-50. <i>A. prostrata</i> , Heller. (W. Ind.)	
39	{ Test very dark coloured... <i>A. fumigata</i> , Grube. (Med., N.W. Eur.)	
	{ Not of a dark colour.....	41
41	{ No dorsal tubercle, neural gland opening into atrium. <i>A. Marionii</i> , Roule. (Med.)	
	{ Dorsal tubercle present, with neural gland opening on it	42

* The number of tentacles in this species seems variable. *Ascidia incrassata*, Heller, also comes in here, but cannot readily be distinguished from the description.

† Sluiter has just described a new species from the Malay Archipelago under this name "*translucida*." It is, however, quite distinct from the 'Challenger' species, and will require to be renamed.

‡ The *A. Olrikii* of Traustedt (1883), described by him in 1880 under the name of *A. mentula*, seems indistinguishable from this species.

42	{ Body 4 or 5 times longer than broad. <i>A. elongata</i> , Roule. (Med.)	
	{ Body not much longer than broad	43
43	{ Appearance porcelain-like	44
	{ Not porcelain-like.....	45
44	{ Mantle blue, test cartilaginous and smooth. <i>A. arachnoidea</i> , Forb. (Med. & N.W. Eur.)	
	{ Mantle milk-white, test warty and fibrous. <i>A. ingeria</i> , Traust. (Med.)	
45	{ Stigmata 1 large and 2 small, or 4 small in a mesh. <i>A. kuneides</i> , Sl. (Mal.)	
	{ Stigmata not so arranged.....	46
46	{ Test containing a remarkable abundance of branched vessels. <i>A. reptans</i> *, Heller. (Med.)	
	{ Test with no remarkable development of vessels	47
47	{ Dorsal tubercle horseshoe-shaped	48
	{ Dorsal tubercle not horseshoe-shaped.....	49
49	{ Apertures far apart, test thickish, dorsal tubercle rounded. <i>A. depressiuscula</i> , Heller. (Ind. O.)	
	{ Apertures not far apart, test not thick, dorsal tubercle cordate. <i>A. obliqua</i> †, Ald. (N.W. Eur. & Med.)	
48	{ Branchial sac with intermediate papillæ	50
	{ Branchial sac with no intermediate papillæ	51
50	{ Stigmata short, 4 or 5 in a mesh. <i>A. depressa</i> , Ald. (N.W. Eur., ? Med.)	
	{ Stigmata long, 10 in a mesh. <i>A. koreana</i> , Traust. (Pac.)	
51	{ Transverse vessels of 3 sizes.....	52
	{ Transverse vessels not of 3 sizes	53
52	{ Body thrice as long as broad, siphons very long. <i>A. longitubis</i> , Traust. (W. Ind.)	
	{ Body almost as broad as long, siphons not very long. <i>A. pusilla</i> , Traust. (Med.)	
53	{ Test rather thick and smooth	54
	{ Test rather thin and wrinkled. <i>A. malaca</i> , Traust. (Med.)	
54	{ Colour yellow-grey, tentacles 40-50. <i>A. interrupta</i> , Heller. (W. Ind.)	
	{ Colour milk-white, tentacles 60-70. <i>A. hygomiana</i> , Traust. (W. Ind.)	

The following species of *Ascidia* ‡ are not sufficiently characterized to be put in the table. Some are probably synonyms of well-known species, others may be distinct species, but require further examination and redescription; a few probably do not belong to this genus:—

* *A. vasculosa*, Herdm. (from Kerguelen), has also numerous vessels in the test, but as only the test is known I have excluded the species.

† *A. pellucida*, Ald. & Hanc., comes close to this, and as no details are known in regard to its internal structure it cannot be separated from *A. obliqua*.

‡ Wagner's *Hyalosoma singulare*, from the White Sea (not *Hyalonema*, as misquoted by Traustedt), seems to me to be merely a young specimen of an *Ascidia*.

- Ascidia opalina*, MacGill. (N.W. Eur.)
A. orbicularis, O. F. Müll. (N.W. Eur.)
A. complanata, Fabr. (N. Atl.) [Also *A. complanata*, Verr.]
A. vitrea, v. Ben. (N.W. Eur.)
A. cavernosa, Les. (W. Ind.)
A. albeola, Les. (W. Ind.)
A. multiformis, Les. (W. Ind.) [? Molgulidæ.]
A. variabilis, Les. (W. Ind.) [? Cynthiidæ.]
A. ovalis, Les. (?)
A. proboscidea, Les. (W. Ind.)
A. lobifera, Les.* (W. Ind.?)
A. sydneyensis, Stimps. (Austr.)
A. succida, Stimps. (Austr.)
A. tubifera, Stimps. (China.)
A. calcata, Stimps. (Jap.)
A. rudis †, Ald. (N.W. Eur., Med.)
A. albida, Ald. & Hanc. (N.W. Eur.)
A. elliptica, Ald. & Hanc. (N.W. Eur.)
A. pellucida, Ald. & Hanc. (N.W. Eur.)
A. affinis, Ald. & Hanc. (N.W. Eur.)
A. mollis, Ald. & Hanc. (N.W. Eur.) [Also *A. mollis*, Verr.]
A. Normani, Ald. & Hanc. (N.W. Eur.)
A. plana, Hanc. (N.W. Eur.)
A. Alderi, Hanc. (N.W. Eur.)
A. rubro-tincta, Hanc. (N.W. Eur.)
A. rubicunda, Hanc. (N.W. Eur.)
A. robusta, Hanc. (N.W. Eur.)
A. crassa, Hanc. (N.W. Eur.)
A. inornata, Hanc. (N.W. Eur.)
A. producta, Hanc. (N.W. Eur.)
A. elongata, Ald. & Hanc. (N.W. Eur.)
A. coriacea, Heller. (Med.)
A. verrucosa, Heller. (Med.)
A. rubescens, Heller. (Med.)
A. Suensonii, Traust. (Pac.)
A. capsicum, Costa. (Med.)
Phallusia sulcata, Sav. (Med.)
Ph. clavigera, Otto. (Med.)
Ph. clava, Risso. (Med.)
Ph. holothurioides, Risso. (Med.)
Ph. livida, Risso. (Med.)
Ph. informis, Phil. (Med.)

* Lesueur also gives a list of 30 species of *Ascidia* (names only), chiefly from the Pacific, none of which are now known (see Journ. Philad. Acad. N. S. vol. iii. p. 8, April 1823).

† This, and a number of the following species of Alder and Hancock, may very likely be good species, but they require redescription.

Through the kindness of Canon Norman I have been enabled to examine the

PACHYCHLÆNA, *Herdman*, 1880.

Body attached, sessile. Branchial aperture 8-lobed, atrial 6-lobed.

Test cartilaginous—or tougher, like india-rubber—very thick, solid and opaque.

Branchial sac longitudinally plicated. Internal longitudinal bars bearing large papillæ at the angles of the meshes. Stigmata straight.

Dorsal lamina in the form of a membrane.

Tentacles simple.

Alimentary canal large, placed on the left side of the branchial sac.

Three species are distinguished from the species of *Ascidia* by their remarkably thick and rigid tests:—

1	{	Dorsal lamina not toothed at the margin.	
		<i>P. gigantea</i> , Herdm. (S. Atl.)	
		Dorsal lamina strongly toothed at the margin	1
		Trans. vessels in branchial sac of two sizes, placed alternately; papillæ not lobed.....	
		<i>P. oblonga</i> , Herdm. (Austr.)	
		Trans. vessels all one size; papillæ lobed.	
		<i>P. obesa</i> , Herdm. (Austr.)	

ABYSSASCIDIA, *Herdman*, 1880.

Body oblong, attached by ventral surface. Branchial aperture with from 8 to 12 lobes, atrial with from 6 to 8 lobes. Apertures far apart.

Test soft, cartilaginous, and transparent.

Mantle thin. Muscle-bands chiefly on one side, irregular and feeble.

Branchial sac very delicate, not longitudinally plicated. Stigmata straight.

type specimens of some of Alder and Hancock's species which are in his collection, and I hope in time to be able to examine the rest, and perhaps to re-establish or clear up the synonymy of some of the little-known or doubtful forms. Dr. Norman has drawn up for me the following paragraph explanatory of the very meagre published descriptions of the species named by these excellent investigators:—

“It is much to be regretted that an important work on British Tunicata by Messrs. Alder and Hancock, to the preparation of which many years had been devoted, and which at the time of their death was nearly ready for publication, has never been printed. No doubt in some respects the anatomical and physiological results may have been partially at any rate anticipated, but Albany Hancock's researches were always so thorough that it cannot be doubted that they would disclose much of great value, while more detailed specific descriptions of the species briefly described by these authors are absolutely necessary for their positive identification.”

Dorsal lamina represented by languets, which may be united by a narrow membrane.

Tentacles simple, filiform.

Viscera on either right or left side of branchial sac. Intestine small, posterior to the œsophagus and stomach, and forming a loop open dorsally. Stomach short and wide.

Gonads forming a round mass situated on the intestinal loop.

This genus is the aberrant member of the subfamily. It is intermediate in its characters between *Ascidia* and *Corella*. It contains the two 'Challenger' species *Abyssascidia Wyvillii*, Herdman, obtained from the south of Australia, at a depth of 2600 fathoms, and *Abyssascidia vasculosa*, Herdman, obtained in the Antarctic south-west of Australia, from a depth of 1950 fathoms. They differ, amongst other points, in the following:—

Apertures 12- and 8-lobed, languets separate, viscera on right side	<i>A. wyvillii</i> .
Apertures 8- and 6-lobed, languets united by membrane, viscera on left side	<i>A. vasculosa</i> .

Subfamily CIONINÆ, Roule, 1884.

Body more or less cylindrical, attached by posterior end.

Test thin and gelatinous, may be modified anteriorly to form a lobe covering the apertures.

Mantle with the musculature mainly longitudinal.

Branchial sac provided with internal longitudinal bars. Stigmata straight.

Dorsal lamina represented by languets.

Alimentary canal on left side of branchial sac, extending posteriorly to it.

I use this subfamily in a somewhat different sense from that proposed by Roule. Keeping *Ciona* as the typical form, I remove *Rhopalæa* to the family Clavelinidæ, and I substitute in its place *Rhodosoma*, which seems to me to have more affinity with *Ciona* than with *Ascidia*.

The two genera are as follows:—

Test modified anteriorly to form an operculum covering the apertures	Rhodosoma.
Test not modified	Ciona.

RHODOSOMA *, Ehrenberg, 1828.

Body cubical or cylindrical, attached, truncated anteriorly.

* This is the *Chevreulius* of Lacaze-Duthiers (1865), the *Schizascus* of Stimpson (1855), and the *Pera* (not *Pera*, of Stimpson) and *Peroïdes* of Macdonald.

Test folded at the anterior end, so as to form an operculum covering the apertures. The test is hard and cartilaginous.

Branchial sac with the stigmata large and straight.

Dorsal lamina represented by a series of languets.

Alimentary canal on right side of branchial sac.

Gonads forming a network round the median part of the intestine.

There are two distinct species known:—

The dorsal tubercle simple, keyhole-shaped. *R. callense*, Lac.-Duth. (Med.)

The dorsal tubercle horseshoe-shaped *R. pyxis*, Traust. (W. Ind.)

Three other (?) species—*R. seminudum*, Heller (W. Ind.), *R. pellucidum*, Stimps. (China), and *R. papillosum*, Stimps. (China)—require re-examination.

CIONA * (*Savigny*, 1816), *Fleming*, 1828.

Body cylindrical, attached. Apertures anterior, not distant.

Test gelatinous or membranous.

Mantle with the musculature well developed on both sides, forming a few well-marked longitudinal bands.

Branchial sac with the stigmata straight.

Dorsal lamina represented by a series of languets.

Nerve-ganglion and neural gland placed close behind the dorsal tubercle.

Alimentary canal extending behind the branchial sac.

Gonads placed on the left side in the intestinal loop.

- | | | | | |
|---|---|--|--|---|
| 1 | { | Animals attached in groups by interlocking of villi from posterior end of test | <i>C. fascicularis</i> , Hanc. (N.W. Eur.) | 1 |
| | | Animals separate, solitary | | |
| 1 | { | Body fixed by the whole of left side (<i>Pleurociona</i> , Roule). | | 2 |
| | | <i>C. Edwardsi</i> , Roule. (Med.) | | |
| 2 | { | Body fixed by posterior end or a part of left side..... | | 2 |
| | | Transverse vessels all the same size, meshes not divided | <i>C. Flemingi</i> , Herdm. (N. Atl.) | |
| 2 | { | Transverse vessels of two different sizes, meshes divided horizontally... | | 3 |
| | | Test rough with sharp-pointed projections. | | |
| 3 | { | <i>C. aspera</i> , Herdm. (Jap.) | | 4 |
| | | Test smooth, no projections on test | | |
| 4 | { | Fixed by posterior end and short processes of test, siphons unequal ... | | 5 |
| | | Fixed by part of left side, not posterior, siphons equal. | | |
| 5 | { | <i>C. Savignii</i> , Herdm. (Jap., Med.) | | 5 |
| | | Colour brown, mantle vermilion... <i>C. canina</i> , O.F.M. (N.W.Eur.) | | |
| 5 | { | Colour yellow-green or light grey, mantle same. [Austr.] | | 5 |
| | | <i>C. intestinalis</i> , L. (N.W. Eur., Med., | | |

The following insufficiently characterized species probably

* Including *Pleurociona*, Roule.

belong to *Ciona*, and may, some of them, be synonyms of *C. intestinalis* :—

Ascidia virescens, Bruguière. (N.W. Eur.)

A. corrugata, O. F. Müller. (N.W. Eur.)

A. ocellata, Agassiz. (E. N. Am.)

A. tenella, Stimpson. (E. N. Am.)

A. pulchella, Alder. (N.W. Eur.)

Alina meridionalis, Risso (Med.), may be a *Ciona*, or possibly a Clavelinid.

Family IV. CLAVELINIDÆ, Forbes, 1853.

Body attached by the posterior end, and usually by means of a peduncle, to a creeping basal stolon or common stolonial mass from which young ascidiozooids are formed by gemmation.

Test gelatinous, rarely cartilaginous, usually thin and transparent. Apertures circular, very rarely distinctly lobed.

Branchial sac not folded, often without internal longitudinal bars. The bars, if present, have no papillæ. The stigmata are straight.

Dorsal lamina represented by languets.

Tentacles simple, filiform.

Alimentary canal usually extending beyond the branchial sac posteriorly to form an abdomen.

Gonads placed in the intestinal loop. In addition to sexual reproduction, colonies may be formed asexually by gemmation from the stolon.

This family contains 10 genera *, which may be distinguished as follows :—

1	{ Branchial sac with internal longitudinal bars	1
	{ Branchial sac without internal longitudinal bars	2
1	{ Body divided into distinct abdomen and thorax	3
	{ No distinct abdomen present	4
3	{ Many ascidiozooids united by their posterior parts to form a large colony.....	Diazona.
	{ Few ascidiozooids united irregularly to form small colony	5
5	{ Branchial sac minutely plicated	Rhopalæa.
	{ Branchial sac not minutely plicated	Rhopalopsis.
4	{ Blood-vessels in the test	Sluiteria.
	{ No blood-vessels in the test	Ecteinascidia.
2	{ No distinct abdomen present	6
	{ Abdomen distinct from the thorax	7
6	{ Branchial sac with about 4 rows of stigmata	Perophora.
	{ With about a dozen rows of stigmata	Perophoropsis.

* *Clavelinopsis*, Fewkes, probably does not belong to this family. The single species *C. rubra* seems to be a *Boltenia*.

- | | | | |
|---|---|--|--------------------------|
| 7 | { | Body divided into thorax, abdomen, and a well-marked peduncle. | |
| | | | Podoclavella. |
| | { | Body not pedunculated apart from the long abdomen | 8 |
| 8 | | Stolons, and posterior end of body, united in a solid basal mass of test | Stereoclavella *. |
| | | Stolons distinct, delicate and branched | Clavelina. |

DIAZONA †, *Savigny*, 1816.

Colony massive, not pedunculated, consisting of a basal mass of test surrounding the stolons and from which the ascidiozooids project upwards.

Ascidiozooids elongated, divided into thorax and abdomen, and having the latter imbedded in the common basal mass of test. Both branchial and atrial apertures anterior and 6-lobed.

Test solid and thick in the lower part of the colony, thin and delicate on the upper free parts of the ascidiozooids. Contains numerous pigment-cells.

Branchial sac large and well developed, with internal longitudinal bars but no papillæ.

Dorsal lamina represented by triangular languets.

Viscera extending far behind the branchial sac so as to form an abdomen.

Gonads in the intestinal loop.

Three forms of *Diazona* have been described, which may be only varieties of one species, *D. violacea*, Sav.:—

- | | | | |
|---|---|--|--|
| 1 | { | With no pigment-lines on thorax. <i>D. intacta</i> , Lah. (Med.) | |
| | | With white pigment-lines | 1 |
| | | With pigmented circles round siphons, and inferior branchial circle. | |
| | | No pigmented circles round siphons, branchial circle superior. | |
| | | | <i>D. violacea</i> , Sav. (Med. & N.W. Eur.) |
| | | | <i>D. hebridica</i> , F. & G. ‡ (N.W. Eur.) |

RHOPALÆA §, *Philippi*, 1842.

Body elongated, divided by a constriction into two parts, thorax and abdomen.

Test thick and cartilaginous. Branchial and atrial apertures lobed.

* Also *Pycnoclavella*, Garst.; see p. 603.

† This is the *Syntethys* of Forbes and Goodsir (1853).

‡ Forbes and Goodsir, in their original description, say that the branchial and atrial apertures are not lobed, while Alder states that they are obscurely lobed. In *D. violacea* they are distinctly lobed. Forbes and Goodsir's figure shows pigment around the atrial aperture.

§ The *Rhopalona* of Roule and others. This form has affinities with *Ciona* and the Ascidiidæ, but is, I consider, more closely related to the Clavelinidæ.

Branchial sac minutely plicated; with internal longitudinal bars, which are not papillated.

Tentacles simple.

Heart and pericardium curved into a U-shape.

This genus contains two species:—

Branchial aperture 8-lobed, atrial 6 *R. neapolitana*, Phil. (Med.)

Branchial aperture 6-lobed, atrial 12 ... *R. cerberiana*, Lah. (Med.)

RHOPALOPSIS, *Herdman*, 1890.

Body elongated, divided into thorax and abdomen.

Test cartilaginous. Apertures not distinctly lobed.

Branchial sac not minutely plicated. Internal longitudinal bars present, but not papillated.

This genus contains the two following species:—

Test thin anteriorly, dark coloured *R. fusca*, Herdm. (Mal.)

Test thick all over, light grey *R. crassa*, Herdm. (Mal.)

SLUITERIA, *Ed. v. Ben.*, 1887.

Body short, not divided into thorax and abdomen, united to the stolon by a short peduncle. Apertures both 7-lobed.

Test containing blood-vessels terminating in conical papillæ.

Branchial sac not minutely plicated. Many rows of stigmata present.

Dorsal lamina in the form of a membrane provided with long marginal processes.

This genus was formed for the reception of the single species *S. rubricollis*, Sluiter, from the island of Billiton in the Malay Archipelago.

ECTEINASCIDIA, *Herdman*, 1880.

Body elongated, usually tapering posteriorly, sometimes with a short peduncle; but not divided into thorax and abdomen.

Test thin and membranous, containing no blood-vessels. Apertures not distinctly lobed.

Mantle thin, musculature consisting of transverse bands.

Branchial sac with internal longitudinal bars, but no papillæ.

Dorsal lamina represented by a series of tentacular languets, which may be connected at their bases by a narrow membrane.

Tentacles simple.

Viscera placed on the left side of the branchial sac, and sometimes projecting slightly beyond it posteriorly.

Gonads placed in the intestinal loop, the spermatic vesicles forming a crescentic curve around the ovary.

This genus contains four species, which may be separated as follows :—

- | | | | | |
|---|---|--|--|---|
| | { | Tentacles about 40 in number | <i>E. diaphanis</i> , Sluit. (Mal.) | |
| | { | Tentacles about 80 in number | | 1 |
| 1 | { | Dorsal languets and connecting-ducts wide and membranous. | <i>E. Moorei</i> , Herdm. (Med.) | |
| | { | Dorsal languets and connecting-ducts narrow and papilliform | | 2 |
| 2 | { | Tentacles of 3 lengths, languets separate. | <i>E. turbinata</i> , Herdm. (N. Atl.) | |
| | { | Tentacles not distinctly of 3 lengths, languets united by a narrow dorsal membrane | <i>E. Thurstoni</i> , Herdm. (Ind. O.) | |

Ascidia claviformis, Lesueur* (W. Ind.), probably belongs to this genus, but is not sufficiently characterized.

PEROPHORA (*Lister*, 1834), *Wieg.*, 1835.

Body short, not divided into thorax and abdomen, attached by a short peduncle to a creeping stolon.

Test thin and transparent. Branchial aperture 6-lobed, atrial 5-lobed, rather distant.

Branchial sac with connecting-ducts which may branch to form imperfect internal longitudinal bars. About 4 rows of stigmata present.

Dorsal lamina more or less of a membrane bearing narrow languets.

Alimentary canal placed on the left side of the branchial sac.

This genus contains 3 or 4 species†, as follows :—

- | | | | | |
|---|---|---|--|---|
| | { | Ascidiozooids on distinct pedicels which are jointed; some adhering sand on test | <i>P. Hutchinsoni</i> , Macd. (Austr.) | |
| | { | Ascidiozooids not on distinct pedicels, no jointing present, no adhering sand | | 1 |
| 1 | { | Body colourless, 40 tentacles of 3 sizes, only papilliform connecting ducts | <i>P. Listeri</i> , Wieg. (Atl., ? Med.) | |
| | { | Body greenish, 20 tentacles of 2 sizes, papilliform connecting-ducts with rudimentary internal longitudinal bars. | <i>P. viridis</i> , Verr. (E. N. Am.) | |
| | | | [? = <i>P. banyulensis</i> , Lah. (Med.).] | |

PEROPHOROPSIS, *Lahille*.

Body nearly cylindrical, sessile. Branchial aperture 12-lobed, atrial 6-lobed.

* Journ. Acad. N. S. Philadel., April 1823, vol. iii. p. 5.

† Giard has named a species from Roscoff, *P. fragilis*. It has not yet, I believe, been sufficiently described.

Test thin, membranous, transparent.

Branchial sac with no internal longitudinal bars and no connecting-ducts. Numerous (15 or 16) rows of stigmata are present.

Dorsal lamina represented by languets.

Alimentary canal on the left side of the branchial sac.

Gonads forming a network over the intestinal loop.

This genus contains the single species *Perophoropsis Herdmani*, Laillie, from Banyuls (Med.).

PODOCLAVELLA, *Herdman*, 1890.

Body extremely long and narrow, divided into thorax, abdomen, and a well-marked post-abdominal peduncle.

Test moderately thick, cartilaginous.

Branchial sac with no internal longitudinal bars, and no papilliform connecting-ducts.

Viscera extending behind the branchial sac to form a large abdomen.

I have formed this new genus for the reception of Savigny's *Clavelina borealis*, and a new species which will be described in the Catalogue of Tunicata of the Australian Museum which I am now preparing.

Colour light bluish green, tentacles in 2 rows. *P. borealis*, Sav. (Arct.)

Colour purplish, tentacles in 1 row *P. meridionalis*, Herdm. (Austr.)

STEREOCLAVELLA*, *Herdman*, 1890.

Body elongated; attached to a basal mass of solid test which is formed by the fusion or thickening of the stolons; divided into thorax and abdomen; apertures circular, not lobed.

Test thin anteriorly, may be thick and cartilaginous posteriorly where it joins and forms the stolonial mass.

Branchial sac, &c., as in *Clavelina*.

I have grouped together under this name those species of *Clavelina* which have the stolons and the posterior ends of the bodies imbedded in a basal mass of test. It may be regarded, along with *Podoclavella*, as being scarcely worthy of generic rank, and I am

* Since this was put in type Garstang has published (May 1891) a description of a new genus, *Pycnoclavella*, which seems very closely allied to *Stereoclavella*. However, it may be a distinct form characterized by the presence of stolonial tubes (vessels) in the free test covering the oesophageal region of the body. It contains the species *P. aurilucens*, Garst., found at Plymouth.

quite willing that both should be placed merely as subgenera of *Clavelina*; but I consider that it is convenient to separate off under a distinct name groups of species which resemble one another, but differ from the rest, in some marked characteristic.

The species of *Stereoclavella* are as follows:—

1	{	Dorsal languets short	<i>S. oblonga</i> , Herdm. (Atl.)	1
		Dorsal languets very large		
	{	Horizontal membranes of the branchial sac wide.	<i>S. enormis</i> , Herdm. (S. Atl.)	
		Horizontal membranes narrow	<i>S. australis</i> *, Herdm. (Austr.)	

CLAVELINA, Savigny, 1816.

Body elongated, club-shaped, but with no peduncle beyond the abdomen; attached to a delicate, branched, creeping stolon from which buds are formed; divided into thorax and abdomen.

Test thin, gelatinous, or cartilaginous. Apertures circular, not lobed.

Mantle thin, muscles mainly longitudinal.

Branchial sac without internal longitudinal bars. Stigmata straight, no papilliform connecting-ducts. Horizontal membranes present.

Dorsal lamina represented by languets.

Alimentary canal extending behind the branchial sac to form a well-marked abdomen.

This genus, in the restricted sense in which it is used here, contains only half a dozen species †, some of which, however, are imperfectly characterized.

{	Thorax and abdomen of much the same size	1
	Abdomen much longer than thorax	2
1	Only 2 rows of stigmata in branchial sac. <i>C. pumilio</i> †, M.-Edw. (N.W. Eur.)	3
	At least 6 rows of stigmata	
3	6 to 8 rows of stigmata <i>C. nana</i> §, Lah. (N.W. Eur., Med.)	4
	12 to 16 rows of stigmata	
4	With yellow or brown lines of pigment on the thorax. [Med.) <i>C. lepadiformis</i> §, O. F. M. (N.W. Eur.,	
	With white lines of pigment on thorax. <i>C. Rissoana</i> , M.-Edw. (N.W. Eur.)	
2	Only 3 or 4 rows of stigmata. <i>C. producta</i> , M.-Edw. (N.W. Eur.)	
	About a dozen rows of stigmata. <i>C. Savigniana</i> , M.-Edw. (N.W. Eur.)	

* This species will be described in the Catalogue of Tunicata of the Australian Museum.

† Possibly O. F. Müller's *Ascidia gelatina* is a *Clavelina*.

‡ Possibly the young of *C. lepadiformis* or some other species.

§ With several varieties.

SYMPLEGMA, *Herdman*, 1886.

Colony stalked, consisting of several ovate ascidiaria* connected by branched peduncles.

Ascidiozooids moderately large, not much elongated, and not divided into regions.

Test firm, vessels numerous.

Branchial sac large and well developed, provided with internal longitudinal bars.

Dorsal lamina in the form of a plain membrane.

Alimentary canal and *gonads* forming a mass projecting for a short distance only behind the branchial sac.

This genus, which I placed in 1886 in the family Distomidæ on account of the close resemblance of the colony to that of a *Colella*, I now agree with Labille had better be transferred to the Botryllidæ. The Botryllid affinities, as I pointed out in the original description, are very marked, although *Symplegma* differs more from the other four genera of Botryllidæ than these do from one another.

There is only one known species, *Symplegma viride*, Herdm., from Bermuda.

BOTRYLLUS, *Gärtner & Pallas*, 1774.

Colony thin, incrusting.

Systems circular or stellate.

Ascidiozooids ovate, with their apertures placed far apart.

Test soft and gelatinous, never much thickened.

Branchial sac large, with 3 internal longitudinal bars on each side.

Viscera alongside the branchial sac, at its posterior end.

This genus contains a very large number of species which are very difficult to distinguish. In fact, species do not appear to be at all clearly differentiated; and, to add to the difficulty, many of the descriptions are very imperfect and only take account of external characters which cannot be applied to preserved specimens.

The following is a list of the species of *Botryllus*. In the present state of our knowledge of these forms I feel that it is useless to attempt to distinguish them by brief characters in tabular form. Some of these species have several marked varieties, and most are very variable.

* That part of the colony in which the ascidiozooids are placed.

- B. Schlosseri* (Pallas), Sav. (N.W. Eur., Med.) Yellow with rust-red dots.
B. Baeri, Grube. (Med.) Colony very thin.
B. sannio, Della Valle. (Med.) Colony thick; violet-blue markings.
B. aurolineatus, Giard. (N.W. Eur., Med.) Yellow lines, 8 tent., asc. 2.2 mm. long.
B. morio, Giard. (N.W. Eur., Med.) Nearly black.
B. gemmeus, Sav. (N.W. Eur., Med.) Violet and yellow.
B. violaceus, H. M.-Edw. (N.W. Eur., Med.) Blue, with white lines.
B. tenuis, Della Valle. (Med.) Tentacles 1-3, vessels blue.
B. minutus, Sav. (N.W. Eur., Med.) Asc. 1 mm., 3-5 in syst.
B. smaragdus, M.-Edw. (N.W. Eur.) Green.
B. pruinosis, Giard. (N.W. Eur.) Green.
B. tapetum, Della Valle. (Med.) Grey, 3-8 in syst., 3 tentacles.
B. calendula, Giard. (N.W. Eur.) Yellow, ascidiozoids 1 mm.
B. marionis, Giard. (N.W. Eur.) Ascidiozoids 2.5 mm., 8-10 in syst.; colour brown with white and carmine.
B. rubigo, Giard. (N.W. Eur.) Brown, with red marks.
B. rubens, Ald. & Hanc. (N.W. Eur.) Yellow and red, thin test.
B. virescens, Ald. & Hanc. (N.W. Eur.) Greenish.
B. castaneus, Ald. & Hanc. (N.W. Eur.) Purple-brown, test very thin.
B. Gouldii, Verr. (E. N. Am.)
B. bivittatus, M.-Edw. (N.W. Eur.)

POLYCYCLUS, *Lamarck*, 1816.

Colony thick and fleshy, convex on surface, often lobed.

Systems circular or stellate in outline.

Ascidiozoids ovate, with the apertures rather distant from one another.

Test gelatinous, but solid and much thickened, vessels present.

Branchial sac large and well developed.

Tentacles from 2 to 16 in number.

Alimentary canal placed alongside the posterior end of the branchial sac.

Gonads placed on both sides of the body near the posterior end.

Leaving out a few doubtful forms and older species with imperfect descriptions and which cannot now be determined with any certainty, the genus contains five species. These may be distinguished as follows:—

1	{	Ascidiozoids at least 3 mm. long	1
		Ascidiozoids not 3 mm. long	2
1	{	With 2 tentacles, placed laterally..... <i>P. cyaneus</i> , v. Dr. (Med.)	3
		With more than 2 tentacles	
3	{	Ascidiozoids at least 4 mm. long	4
		Ascidiozoids about 3 mm. long. Tentacles 8, 2 large lateral and 6 small	
		<i>P. violaceus</i> , v. Dr. (Med.)	

- | | | | | |
|---|---|---|---|---|
| 4 | { | Tentacles 8, 2 large lateral and 6 small. | <i>P. Vallii</i> *, Lah. (Med.) | |
| | | Tentacles 6, 2 large lateral and 4 small. | | |
| 2 | { | Tentacles 8, all one size..... | <i>P. Lamarcki</i> , Herdm. (N.W. Eur.) | 5 |
| | | Tentacles 16, 8 long and 8 short | | |
| 5 | { | Ascidiozooids yellowish, marked with brown. | <i>P. Jeffreysi</i> , Herdm. (Med.) | |
| | | Ascidiozooids of a bluish colour ... | | |

BOTRYLLOIDES, *H. Milne-Edw.*, 1842.

Colony thin, incrusting and usually gelatinous.

Systems elliptical or elongated, forming branched and sometimes anastomosing lines.

Ascidiozooids cylindrical, with the apertures placed near one another on the anterior end.

Test soft and gelatinous, never much thickened, penetrated by many vessels.

Branchial sac long and well developed.

Alimentary canal placed alongside the branchial sac at its posterior end.

Gonads placed on both sides of the body near the posterior end.

In this case, as in *Botryllus*, it is useless to attempt to distinguish the species in brief tabular form in our present want of knowledge of the internal structure of so many of them; consequently I give the following list of the known species; some of them are in a very doubtful condition.

- B. Leachii*, Sav. (N.W. Eur., Med.) Purple, with yellow and white marks.
- B. luteum*, v. Dr. (Adr.) Green-yellow; tentacles 8, 4 large; ascidiozooids 3 mm. in length
- B. purpureum*, v. Dr. (Adr.) Tentacles 8, 4 large; ascidiozooids 3 mm.
- B. Gascoi*, Della Valle. (Med.) Tentacles 4; ascidiozooids 2 mm.
- B. Emeryi*, Della Valle. (Med.) Tentacles 8, 4 large.
- B. rubrum*, H. M.-Edw. (N.W. Eur., Med.) Colour yellow to red; 4 tentacles.
- B. rosaceus*, Grube. (Med., Red S.) Purple-red with white lines.
- B. morioniformis*, Della Valle. (Med.) Yellow-green; tentacles 8, alternately larger; ascidiozooids 2 mm.
- B. albicans*, H. M.-Edw. (N.W. Eur., Med.) Pure white.
- B. ciliatus*, D. Ch. (Med.)
- B. tyreum*, Herdm. (Mal.)
- B. perspicuum*, Herdm. (Mal.) And var. *rubicundum*.
- B. nigrum*, Herdm. (Atl.)

* With several colour varieties noted by Labille.

B. fulgurale, Herdm. (N. Atl.)

B. rotifera, H. M.-Edw. (N.W. Eur.) Yellow, with red marks.

B. prostratum, Giard. (N.W. Eur.) Ascidiozooids larger and flatter than in *B. rotifera*.

B. clavelina, Giard. (N.W. Eur.) Perfectly transparent.

B. insigne, Giard. (N.W. Eur.) Dark brown, marked with yellow and violet.

B. sparsa, Alder. (N.W. Eur.)

B. pusilla, Alder. (N.W. Eur.)

B. radiata, Ald. & Hanc. (N.W. Eur.) Yellow.

B. ramulosa, Ald. & Hanc. (N.W. Eur.) Pellucid and cream-colour.

SARCOBOTRYLLOIDES, von Drasche, 1883.

Colony thick and fleshy, often lobed.

Systems elliptical or elongated, forming branched and sometimes anastomosing lines.

Ascidiozooids cylindrical, with the apertures placed near one another on the anterior end.

Test gelatinous, rather solid and greatly thickened; many vessels present.

Branchial sac large and well developed.

Tentacles 8 to 16 in number.

Alimentary canal placed alongside the posterior part of the branchial sac.

Gonads placed on both sides of the body near the posterior end.

Six species of this genus are known to me, and may be distinguished as follows:—

1	{	Tentacles 8.....	1
		Tentacles 16	2
1	{	Test opaque white	<i>S. superbum</i> , v. Dr. (Med.)
		Test transparent grey	3
3	{	Colour red-purple; ascidiozooids 3 mm. long, very close; 16 rows of stigmata	<i>S. purpurcum</i> , n. sp. (Austr.)
		Colour dull slate-grey; ascidiozooids 2 mm. long, not very close; 14 rows of stigmata.....	<i>S. pannosum</i> , n. sp. (Austr.)
		Stomach has cæcum	<i>S. anceps</i> , n. sp. (Austr.)
2	{	No cæcum present.....	4
4	{	Tentacles 8 long and 8 short	<i>S. Wyvillii</i> , Herdm. (N. Atl.)
		Tentacles 4 long, 4 medium, and 4 short.	<i>S. jacksonianum</i> , n. sp. (Austr.)

Family II. DISTOMIDÆ (*Giard*, 1872), *Herdman*, 1885.

Colony rounded and massive, rarely incrusting, either sessile or supported upon a long or short peduncle.

Systems irregular, inconspicuous or absent.

Ascidiozooids of moderate length, and having the body divided into two regions, thorax and abdomen; they may be provided with long vascular ectodermal appendages.

Test gelatinous or cartilaginous, often thickened at the base to form a peduncle, which may be traversed by large canals containing the vascular appendages of the ascidiozooids. There are sometimes calcareous spicules, which, however, are not stellate.

Branchial sac well developed; no internal longitudinal bars present.

Dorsal lamina represented by a series of languets.

Alimentary canal placed posteriorly to the branchial sac, so as to form an abdomen.

Gonads and heart in the intestinal loop, or alongside it. Sper-
matic vesicles numerous, vas deferens straight.

The genera in this family may be separated as follows:—

	{	Colony with a well-marked peduncle	1
		Colony sessile or only shortly pedunculated	2
1	{	With an incubatory pouch in which embryos develop	Colella.
		No incubatory pouch present	3
3	{	Ascidiozooids completely imbedded in a common test. .	Oxycorynia.
		Ascidiozooids not completely imbedded in a common test.	Chondrostachys.
2	{	With an incubatory pouch and an atrial languet ..	Distaplia.
		No incubatory pouch present	4
4	{	Ascidiozooids enclosed by capsules formed of discoid spicules.	Cystodytes.
		No spicules present in test	5
5	{	With an atrial siphon	Distoma.
		With a trifid atrial languet	Heterotrema.

COLELLA, *Herdman*, 1885* (*MS.*, 1880).

Colony more or less club-shaped, composed of a peduncle attached at the base, and bearing on its summit a more or less ellipsoidal ascidiarium.

Ascidiozooids imbedded in a common test; usually arranged in lines but not divided into systems. No common cloacal cavities. Body composed of thorax and abdomen, and a long ectodermal vascular process from the posterior end of the latter. Apertures six-lobed, not prominent.

* This genus was fully diagnosed, with *Colella Thomsoni* as the type species, in my thesis for the degree of Doctor of Science, sent in to the University of Edinburgh and accepted by the Science Degrees Committee in March 1880; and was published without material change in the second part of my 'Challenger' Report, printed off in 1885.

Test gelatinous, penetrated by the ectodermal prolongations from the ascidiozooids.

Branchial sac well developed; no internal longitudinal bars present.

Dorsal lamina composed of languets.

Alimentary canal posterior to the branchial sac.

Gonads placed on the left side of the intestinal loop. Testes grape-like in arrangement. Embryos develop in an incubatory pouch which is a large diverticulum from the atrial cavity.

The species of *Colella* may be distinguished as follows:—

	{	Peduncle branched	1
		Peduncle unbranched	2
1	{	Lower end of peduncle branched	3
		Upper end of peduncle branched, 3 rows of stigmata, tentacles 5 large and 5 small <i>C. plicata</i> , n. sp. (Austr.)	
3	{	Peduncle short and wide, tentacles 16, 8 rows of stigmata. <i>C. concreta</i> , Herdm. (A. Arct.)	
		Peduncle long and narrow	4
4	{	Tentacles 12, all of one size, 4 rows of stigmata. <i>C. ramulosa</i> , Herdm. (S. Pac.)	
		Tentacles of two sizes <i>C. tenuicaulis</i> , n. sp. (Austr.)	
2	{	Peduncle longer than body	5
		Peduncle not longer than body	6
5	{	Colour red, tentacles 12 <i>C. pulchra</i> , Herdm. (Austr.)	
		Colour bluish, tentacles 8, many rows of stigmata. <i>C. Thomsoni</i> , Herdm. (Mal.)	
	{	Colour greyish yellow	7
7	{	Tentacles large, 16; 5 rows of stigmata. [A. Arct. <i>C. pedunculata</i> , Q. & G. (Austr.,	
		Tentacles small, 8 <i>C. Gaimardi</i> , Herdm. (S. Atl.)	
6	{	Colony wide at top	8
		Colony narrow at top	9
8	{	Colour grey <i>C. Murrayi</i> , Herdm. (S. Pac.)	
		Colour with a reddish tinge do., var. <i>rubida</i> , Herdm. (Austr.)	
9	{	Body not longer than broad, tentacles 12, 4 rows of stigmata. <i>C. Quoyi</i> , Herdm. (A. Arct.)	
		Body longer than broad	10
10	{	Ascidiozooids less than 2 mm. long, tentacles numerous (16 large and 16 small) and close <i>C. elongata</i> , Herdm. (Austr.)	
		Ascidiozooids more than 5 mm. long, tentacles not numerous. <i>C. claviformis</i> , n. sp. (Austr.)	

OXYCORYNIA, von Drasche, 1882.

Colony club-shaped, pedunculated. The peduncle traversed by the long vascular appendages of the ascidiozooids, from which buds are formed.

Ascidiozooids completely imbedded in the common test; divided into thorax and abdomen, and having long ectodermal appen-

dages. Branchial and atrial apertures circular, the former sometimes 4-lobed.

Test thin and transparent round the ascidiozooids, more solid and opaque in the peduncle.

Branchial sac with numerous rows of stigmata. No internal longitudinal bars.

Tentacles 8, 4 large and 4 small.

Alimentary canal behind the branchial sac. Stomach smooth.

Gonads in the intestinal loop. No incubatory pouch present.

This genus contains the single species *Oxycorynia fascicularis*, von Drasche, from the Caroline Islands.

CHONDROSTACHYS, *Macdonald*, 1858.

Colony club-shaped, pedunculated. The peduncle traversed by the long vascular appendages of the ascidiozooids, from which buds are formed.

Ascidiozooids not imbedded in a common test, but freely projecting from the surface of the colony, each covered by its own thin layer of test. Body divided into thorax and abdomen, and having a long ectodermal vascular appendage. Branchial aperture 4-lobed.

Test thin and transparent over the ascidiozooids, thicker and more opaque in the common peduncle.

Branchial sac with no internal longitudinal bars (?).

Alimentary canal behind the branchial sac, forming an abdomen.

Gonads alongside the intestine. No incubatory pouch present.

This genus contains a single species, from Bass Strait, Australia, unnamed by Macdonald.

DISTAPLIA, *Della Valle*, 1881.

Colony in the form of lobed masses or club-shaped knobs.

Systems distinct, each one forming a knob or lobe of the colony.

Ascidiozooids elongated antero-posteriorly, and placed vertically in the colony. Branchial aperture 6-lobed. Atrial aperture provided with a languet.

Test gelatinous, penetrated by ectodermal prolongations from the ascidiozooids.

Branchial sac with 4 rows of long stigmata, crossed by narrow intermediate transverse vessels.

Dorsal lamina represented by a series of short languets.

Alimentary canal posterior to the branchial sac. Stomach ovate, smooth-walled.

Gonads placed on the right side of the intestinal loop. The embryos develop in an incubatory pouch formed as a diverticulum from the atrial cavity. The larvæ are of large size and are gemmiparous.

The four known species of *Distaplia* may be separated thus:—

- | | | |
|---|--|---|
| | { Colony forming a thick incrusting mass. | |
| | <i>D. lubrica</i> , v. Dr. (Med.) | |
| | { Colony formed of a number of distinct knobs or club-shaped masses... | 1 |
| | { Ascidiozooids and larvæ very large; stomach-wall reticulated. | |
| 1 | <i>D. magnilarva</i> , D. Valle. (Med.) | |
| | { Ascidiozooids and larvæ of moderate size; stomach-wall smooth | 2 |
| | { Knobs of colony with short peduncles or none; colour rose-red. | |
| | <i>D. rosea</i> , D. Valle. (Med. & N.W. Eur.) | |
| 2 | { Knobs with well-marked peduncles; colour dark violet or purple. | |
| | <i>D. Vallii</i> , Herdm. (Med. & Mal.) | |

DISTOMA, Gærtner, 1774, Sav., 1816.

Colony massive, sessile or scarcely pedunculated.

Systems absent or imperfect.

Ascidiozooids divided into thorax and abdomen, not enclosed in calcareous capsules, and having both apertures 6-lobed and opening directly on to the surface. Thorax and abdomen often united by a long narrow pedicle.

Test gelatinous, with no spicules.

Branchial sac with from 3 to 20 or more rows of stigmata. No internal longitudinal bars.

Dorsal lamina represented by languets.

Alimentary canal posterior to the branchial sac.

Gonads placed alongside the intestinal loop. No incubatory pouch present for the embryos.

The species of *Distoma* may be separated thus:—

- | | | |
|---|--|---|
| | { Wall of stomach smooth | 1 |
| | { Stomach-wall not smooth | 2 |
| | { Wall of stomach thickened to form a reticulation; 24 rows of stigmata. | |
| | <i>D. adriaticum</i> , v. Dr. (Med.) | |
| 2 | { Wall of stomach grooved longitudinally; 12 rows of stigmata. [Eur.] | |
| | <i>D. cristallinum</i> *, Ren. (Med., N.W.) | |
| 1 | { With only 3 rows of stigmata in branchial sac | 3 |
| | { With more than 3 rows of stigmata | 4 |

* *D. vitreum*, Sars, is either this species or closely related to it.

- 3 { Colony of a resinous-brown colour. *D. mucosum*, v. Dr. (Med.)
 { Colony blackish, not sandy *D. Pancerii* *, D. Valle. (Med.)
- 4 { Colony blackish, sandy on surface. *D. Costæ*, D. Valle. (Med.)
 { Colony red *D. variolosum*†, Gärtn. (N.W. Eur.)

HETEROTREMA, *Fiedler*, 1889.

Colony massive, branched, attached.

Systems placed in irregularly polygonal areas marked out by grooves.

Test gelatinous, with no spicules.

Ascidiozooids with body separated into thorax and abdomen, and having ectodermal processes. Branchial aperture 6-lobed; atrial not lobed, but with a trifid atrial languet.

Branchial sac well developed, without internal longitudinal bars, with 8-10 rows of stigmata.

Dorsal lamina represented by languets.

Alimentary canal placed behind the branchial sac. Stomach longitudinally folded.

Spermatic vesicles numerous, placed in the posterior part of the abdomen.

This genus, closely allied to *Distoma*, contains the single species *Heterotrema Sarasinorum*, Fiedl., from Ceylon.

CYSTODYTES, *von Drasche*, 1883 (subgen.), *Herm.*, 1886.

Colony of irregular form, attached and incrusting, sometimes lobed, and of moderate thickness.

Ascidiozooids surrounded by capsules formed of calcareous discoid spicules. No ectodermal appendages present.

Test cartilaginous, containing calcareous disc-shaped spicules which form a capsule round each ascidiozooid.

Branchial sac small; about 4 rows of stigmata.

Abdomen as large as thorax. Stomach smooth.

The five known species of *Cystodytes* may be distinguished as follows:—

{ Ascidiozooids arranged in distinct systems	1
{ Ascidiozooids not distinctly arranged in systems	2

* *D. plumbeum*, D. Valle (Med.), seems to differ from this only in the size and proportions of the ascidiozooids.

† *D. rubrum*, Sav., is close to if not identical with this.

1	{ Colour yellowish brown	<i>C. durus</i> , v. Dr. (Med.)	
	{ Colour whitish and translucent	<i>C. cretaceus</i> , v. Dr. (Med.)	
2	{ Colour violet	<i>C. Delle Chiaie</i> , D. Valle. (Med.)	3
	{ Colour brownish grey		
3	{ Test not much vacuolated	<i>C. Draschii</i> , Herdm. (S. Atl.)	
	{ Test very much vacuolated, darker than last.		
		<i>C. philippinensis</i> , Herdm. (Mal.)	

Family III. POLYCLINIDÆ, *Giard*, 1872.

Colony usually massive; sometimes incrusting, sometimes lobed or even pedunculated.

Systems of various shapes, sometimes very irregular or absent. Common cloacal apertures usually inconspicuous.

Ascidiozooids always elongated antero-posteriorly, and usually divided into three distinct regions. Branchial aperture 6- or 8-lobed; atrial aperture often with atrial languet.

Test gelatinous or cartilaginous, sometimes rendered stiff by imbedded sand-grains.

Branchial sac usually small and not highly developed. Stigmata usually small. There may be papilliform connecting-ducts but never internal longitudinal bars.

Dorsal lamina represented by a series of languets.

Tentacles small and not numerous.

Alimentary canal extending considerably beyond the branchial sac posteriorly.

Gonads placed behind the intestinal loop in the postabdomen. Testis represented by a number of small spermatic sacs, attached to a large vas deferens.

Gemmation from the postabdomen, which has the heart at its extremity.

This very large family* contains about twenty genera (or subgenera), which may be distinguished briefly as follows:—

{	Branchial sac with wide meshes and no true stigmata.	Pharyngodictyon.	1
	Branchial sac normal		

* I cannot follow Lahille in breaking it up into the two families Polyclinidæ and Aplididæ; nor can I employ, as he does, the twisting of the intestinal loop as a primary character in distinguishing the genera; intermediate conditions are found between the typical Polyclinid condition and that found in *Amaroucium*.

1	{ Branchial sac with papilliform connecting-ducts in its interior.	Tylobranchion.	
	{ Branchial sac not papillated *.....		2
2	{ Stomach smooth-walled		3
	{ Stomach-wall thickened		4
3	{ Horizontal membranes denticulated to form projections between the stigmata	Glossophorum.	
	{ No such projections formed.....		5
5	{ Intestinal loop simple, U-shaped.....	Aplidiopsis.	
	{ Intestinal loop twisted		6
6	{ Systems simple	Polyclinum.	
	{ Systems compound.....	Aurantium.	
4	{ Atrial aperture on the dorsal edge		7
	{ Atrial aperture on the anterior end		8
7	{ Sand-grains imbedded in and incrusting test ...	Psammaplidium.	
	{ Test not containing sand-grains	Aplidium.	
8	{ Branchial aperture 8-lobed		9
	{ Branchial aperture 6-lobed		10
9	{ Wall of stomach folded or grooved.....		11
	{ Wall of stomach areolated or with grooves broken up.....		12
11	{ Systems simple	Circinalium.	
	{ Systems compound		13
13	{ Postabdomen slightly pedunculated	Fragarium †.	
	{ Postabdomen not at all pedunculated	Fragaroides †.	
12	{ Postabdomen separated from abdomen by constriction.	Parascidia.	
	{ Postabdomen not separated off by constriction ...	Morchellioides.	
10	{ Wall of stomach folded or grooved		14
	{ Wall of stomach areolated		15
14	{ Wall of stomach folded transversely	Atopogaster.	
	{ Wall of stomach folded longitudinally		16
16	{ Postabdomen separated off by a constriction	Polyclinoides.	
	{ Postabdomen not separated off by constriction		17
17	{ Atrial aperture 6-lobed	Sigillina.	
	{ Atrial aperture with a languet	Amaroucium ‡.	
15	{ Postabdomen separated off by constriction	Sidnyum.	
	{ Postabdomen not separated off		18
18	{ Systems simple	Syncoicum.	
	{ Systems compound.....	Morchellium.	

PHARYNGODICTION, *Herdman*, 1885.

Colony club-shaped, or consisting of a "head" (or ascidiarium) placed on a short peduncle.

Systems inconspicuous.

* In *Glossophorum* the so-called papillæ are due to a denticulation of the horizontal membranes.

† These two are very closely related.

‡ The subgenus *Morchelliopsis* of Lahille comes in here, but I do not see that it can be separated from *Amaroucium*. The specific name of the single species, "*Morchelliopsis Pleyberianus* Lahille," must, according to the laws of nomenclature, be *punctum*, Giard.

Ascidiozooids very long antero-posteriorly, and distinctly divided into regions.

Test of a firm gelatinous consistence.

Branchial sac formed of a simple meshwork of longitudinal and transverse vessels. No true stigmata present.

Dorsal lamina represented by a series of languets.

Gonads placed in a long postabdomen extending behind the intestinal loop.

This genus was formed for the remarkable deep-sea species *Pharyngodictyon mirabile*, Herdm., trawled in the Southern Ocean at a depth of 1600 fathoms.

TYLOBRANCHION *, *Herdman*, 1885.

Colony large, massive.

Systems inconspicuous.

Ascidiozooids large, elongated antero-posteriorly, and distinctly divided into regions.

Test gelatinous.

Branchial sac large and well developed. Transverse vessels provided with numerous large papilliform connecting-ducts which may bifurcate to form rudimentary internal longitudinal bars.

Dorsal lamina represented by a series of languets.

Alimentary canal large. Stomach-wall folded longitudinally.

Gonads forming a long postabdomen.

This genus includes the single species *Tylobranchion speciosum*, Herdm., from Kerguelen Island.

GLOSSOPHORUM †, *Lahille*, 1886.

Colony subglobular or expanded and lobed, attached, sandy. Systems usually one in each colony, simple.

Ascidiozooids divided into thorax, abdomen, and postabdomen separated by narrow pedicles. Branchial aperture 6-lobed, atrial with a lobed languet.

Test covered with agglutinated sand-grains.

Branchial sac with well-marked horizontal membranes, which are denticulated or crenated so as to have a number of small

* This genus has affinities with *Diazona* and the Clavelinidæ, but is, I think, more closely allied to the Polyclinidæ.

† This genus seems very similar to *Pleurolophium*, Giard, 1874 (Assoc. Franç., Lille).

papilliform projections nearly as numerous as the stigmata. About a dozen rows of stigmata. No internal longitudinal bars.

Dorsal languets present.

Alimentary canal with the intestinal loop twisted. Stomach smooth.

There are two species of *Glossophorum* :—

- | | | |
|---|---|--|
| { | Colony small, globular; 32 tentacles; atrial languet lobed. | |
| | <i>G. sabulosum</i> , Giard. (N.W. Eur., Med.) | |
| { | Colony large, flattened; 16 tentacles; atrial languet simple. | |
| | <i>G. humile</i> , Lah. (Med.) | |

The *Amaroucium bilaterale* of Giard (N.W. Eur., 1874) probably belongs to this genus.

APLIDIOPSIS, *Lahille*, 1890.

Colony subglobular, attached, sessile. Systems irregular or indistinct. Branchial aperture 6-lobed, atrial imperfectly lobed.

Ascidiozoids divided into thorax, abdomen, and postabdomen.

Branchial sac with numerous stigmata.

Alimentary canal with no twisting of the intestine. Stomach smooth.

Postabdomen not separated off from abdomen by a constriction.

The following species may be referred to this genus :—

- | | | | |
|-----|-----------------------------------|---|---|
| { | Stigmata very small..... | <i>A. incertus</i> , Herdm. (Mag.) | 1 |
| | Stigmata well developed | | |
| 1 { | Stomach globular..... | <i>A. vitreus</i> , Lah. (Med.) | 2 |
| | Stomach pyriform | | |
| 2 { | Stomach placed vertically | <i>A. minutus</i> , Herdm. (South. O.) | |
| | Stomach placed horizontally | <i>A. pyriformis</i> , Herdm. (South. O.) | |

AURANTIUM, *Giard*, 1872.

This genus, or subgenus, seems to differ from *Polyclinum* merely in having the systems compound. It contains a single species, *A. aurantium* (= *Polyclinum aurantium*), M.-Edw., which is possibly identical with *Sidnyum turbinatum* of Savigny.

This group is probably scarcely of sufficient importance to warrant its separation from *Polyclinum*.

POLYCLINUM, *Savigny*, 1816.

Colony massive, usually sessile.

Systems simple or compound, often irregular.

Ascidiozooids elongated, more or less distinctly divided into three regions. Branchial aperture 6-lobed; atrial aperture provided with a languet.

Test gelatinous or cartilaginous, sometimes incrustated with sand.

Branchial sac large and well developed.

Alimentary canal usually long and complicated, often twisted. Stomach smooth-walled.

Postabdomen separated from the abdomen by a constriction, often projecting from one side of the intestinal loop.

Some of the older described species of *Polyclinum* are so imperfectly known that the following table cannot be regarded as quite satisfactory, but it may be of use in roughly distinguishing the species * :—

	{	Colony incrustated with sand	1
		Colony not sandy	2
1	{	Not very much sand in test, stigmata small. <i>P. molle</i> , Herdm. (S. Atl.)	
		A good deal of sand in test, stigmata long and narrow. <i>P. fungosum</i> , Herdm. (Austr.)	
2	{	Postabdomen attached to ventral edge of abdomen. <i>P. depressum</i> , Herdm. (Austr.)	
		Postabdomen attached to posterior end of abdomen	3
3	{	Colony of a greenish colour	4
		Colour not green, generally grey or violet	5
4	{	Gelatinous, green..... <i>P. viride</i> , D. Ch. (Med.)	
		Not gelatinous, olive-green..... <i>P. ficus</i> , Sav. (N.W. Eur., ? Med.)	
5	{	Abdomen separated from thorax by a very long pedicle, as long as abdomen	
		<i>P. uranium</i> , Sav. (Red S.)	
6	{	Abdomen separated only by a short pedicle	6
6	{	Of a whitish or grey colour	7
		Of a violet or purple tint	8
7	{	Colour whitish..... <i>P. stellatum</i> , D. Ch. (Med.)	
		Colour grey	
8	{	<i>P. vesiculosum</i> , D. Ch. (Med.)	
8	{	Of a purple colour	
		<i>P. septosum</i> , D. Ch. (Med.)	
9	{	Of a bluish or violet tint	9
9	{	With about 18 rows of stigmata ... <i>P. hesperium</i> , Sav. (Red S.)	
		With 14-16 rows of stigmata	10
10	{	Abdomen nearly as large as thorax, stigmata small. <i>P. isiacum</i> , Sav. (Red S.)	
		Abdomen much smaller than thorax, stigmata large	11
11	{	With 14 rows of stigmata	
		<i>P. constellatum</i> , Sav. (Ind. O.)	
12	{	With 15-16 rows of stigmata	12
12	{	Colour dark violet	
		<i>P. saturnium</i> , Sav. (Red S., Med.)	
	{	Colour light violet	
		<i>P. cythereum</i> , Sav. (Red S.)	

* *Polyclinum diazonæ*, D. Ch. (Med.), certainly does not belong to this genus—probably not to the family. *P. fuscum*, D. Ch. (Med.), has the branchial aperture 8-lobed, and therefore cannot be a *Polyclinum*.

PSAMMAPLIDIUM, *Herdman*, 1886.

Colony incrusting, massive, or lobed.

Systems inconspicuous.

Ascidiozooids usually small, not much elongated, and not distinctly divided into regions.

Test thick, and greatly strengthened by imbedded and incrusting sand-grains and other foreign bodies, which form a great part of its bulk.

Branchial sac small and not well developed.

Postabdomen usually short.

The species referred to this genus may be separated as follows:—

- | | | |
|----|---|----|
| | { Colony broken up into narrow branched and anastomosing strands. | |
| | { Colony not retiform <i>P. retiforme</i> , Herdm. (A. Arct.) | 1 |
| 1 | { Colony thin and incrusting | 2 |
| | { Colony massive | 3 |
| 2 | { Colour dark brown <i>P. effrenatum</i> , Herdm. (S. Atl.) | |
| | { Colour stone-grey <i>P. incrustans</i> , n. sp. (Austr.) | |
| 3 | { External part of test forming a distinct layer | 4 |
| | { External layer of test not modified | 5 |
| 4 | { Colony formed of Ascidarium on narrow peduncle. | |
| | { Colony formed of irregular masses not pedunculated <i>P. pedunculatum</i> , n. sp. (Austr.) | 6 |
| 6 | { Colony not lobed <i>P. flavum</i> , Herdm. (S. Atl.) | |
| | { Colony lobed | 7 |
| 7 | { Central layer of test free from sand. | |
| | { Sand all through test <i>P. fragile</i> , n. sp. (Austr.) | 8 |
| 8 | { Stigmata much wider than interstigmatic vessels. | |
| | { Stigmata same width as vessels or narrower. <i>P. solidum</i> , n. sp. (Austr.) | |
| | { Stigmata same width as vessels or narrower. <i>P. lobatum</i> , n. sp. (Austr.) | |
| 5 | { Colony ovate or pyriform | 9 |
| | { Colony irregularly lobed | 10 |
| 9 | { Much imbedded sand; colony quite stiff | 11 |
| | { Not much sand; colony firm, but not stiff. | |
| | { Shape ovate, colour green-grey, muscles weak, stigmata long. | |
| 11 | { Shape pyriform, colour yellow-grey, muscles strong, stigmata short. | |
| | { Short cylindrical lobes from common base, stigmata very narrow. | |
| 10 | { Lobes irregular, stigmata not very narrow <i>P. ovatum</i> , Herdm. (Austr.) | |
| | { Lobes irregular, stigmata not very narrow <i>P. subviride</i> , Herdm. (S. Atl.) | |
| | { Lobes irregular, stigmata not very narrow <i>P. pyriformis</i> , Herdm. (Austr.) | |
| 12 | { Stomach globular, smooth-walled ... <i>P. exiguum</i> , Herdm. (S. Atl.) | |
| | { Stomach quadrate, folded longitudinally. | |
| | { Stomach quadrate, folded longitudinally. <i>P. spongiforme</i> , Herdm. (Austr.) | |
| | { Stomach quadrate, folded longitudinally. <i>P. rude</i> , Herdm. | |

POLYCLINOIDES, *von Drasche*, 1883.

Colony forming rounded transparent masses.

Systems irregular.

Test transparent.

Ascidiozooids divided into thorax, abdomen, and postabdomen. Branchial aperture 6-lobed. Atrial aperture placed far back on the dorsal edge and not lobed; anterior to it is an atrial languet.

Branchial sac with 8 rows of stigmata. No internal longitudinal bars and no papillæ.

Alimentary canal not twisted. Stomach with numerous flat longitudinal folds. Anus provided with two large lobes.

Gonads in a moderately long postabdomen, separated from the abdomen by a slight constriction.

This contains the species *Polyclinoides diaphanum*, v. Drasche, from Mauritius.

APLIDIUM, *Savigny*, 1816.

Colony massive or lobed, not pedunculated.

Systems compound and irregular.

Ascidiozooids not much elongated. Branchial aperture 6-lobed; atrial lobed, or having a more or less rudimentary languet, and placed far back.

Test gelatinous or cartilaginous, rarely sandy.

Branchial sac fairly well developed.

Alimentary canal of moderate size. Stomach-wall folded longitudinally.

Postabdomen usually short.

Those species of the genus which have been sufficiently characterized can be distinguished thus:—

	{	Atrial aperture distinctly lobed or with a languet	1
		Atrial aperture with no visible lobes or languet	2
1	{	Atrial aperture 6-lobed	3
		With an atrial languet	4
3	{	Colony sandy; branchial sac not pigmented. <i>A. asperum</i> , v. Dr. (Med.)	
		Colony not sandy; branchial sac pigmented. <i>A. pellucidum</i> , v. Dr. (Med.)	
4	{	Atrial languet bifurcated <i>A. fuscum</i> , Herdm. (A. Arct.)	
		Atrial languet not bifurcated	5
5	{	10 grooves on stomach..... <i>A. fallax</i> , Johns. (N.W. Eur.)	
		4 grooves on stomach.....	6
6	{	Brown pigment-dots on dorsal edge of thorax. <i>A. tremulum</i> , Sav. (Red S.)	
		No such pigment-dots	7

7	{	Colony greyish; postabdomen short. <i>A. lobatum</i> , Sav. (Med., Red S.)	
		Colony yellowish; postabdomen very long. <i>A. caliculatum</i> , Sav. (N.W. Eur.)	
2	{	Both transverse and longitudinal muscle-bands very strong.	
		<i>A. crassum</i> , Herdm. (S. Atl.)	
		Musculature not powerful	8
8	{	Stigmata very minute and irregular	9
		Stigmata normal	10
9	{	Colour dark grey	<i>A. despectum</i> , Herdm. (N. Atl.)
		Colour dark smoke-brown	<i>A. fumigatum</i> , Herdm. (A. Arct. [& Mal.)
10	{	With very slight grooves on stomach. <i>A. leucophæum</i> , Herdm. (A. Arct.)	
		Grooves of stomach-wall well marked	11
11	{	Grooves few, 4 to 6	12
		Grooves numerous, 10 or more	13
12	{	Colony sandy.....	<i>A. gibbulosum</i> *, Sav. (Med.)
		Not sandy	14
14	{	With only 6 rows of stigmata	<i>A. griseum</i> , Lah. (Med.)
		With about a dozen rows of stigmata. <i>A. effusum</i> , Sav. (Red S.)	
13	{	Colony somewhat sandy on surface... <i>A. incrustans</i> , Herdm. (S. Atl.)	
		Colony not sandy	15
15	{	Branchial sac pigmented	<i>A. cæruleum</i> , Lah. (N.W. Eur.)
		Not pigmented	<i>A. zostericola</i> , Giard. (N.W. Eur.)

AMAROUCIUM, *H. Milne-Edwards*, 1841.

Colony massive, sometimes lobed or pedunculated.

Systems usually compound and irregular.

Ascidiozooids elongated. Branchial aperture 6-lobed; atrial usually provided with a long languet, placed close to the branchial aperture.

Test cartilaginous or gelatinous.

Branchial sac moderately developed.

Alimentary canal of moderate size. Stomach-wall folded longitudinally.

Postabdomen usually very long.

The recognizable species of this large genus may be distinguished thus:—

{	{	Systems simple, regular, and with few ascidiozooids. [Eur.]	
		<i>A. Nordmanni</i> , M.-Edw. (N.W.)	
1	{	Systems compound, irregular, and with many ascidiozooids	1
		Stomach folded longitudinally	2
		Stomach simply rayed	3
3	{	Colony transparent, colourless.....	<i>A. crystallinum</i> , D. Valle. (Med.)
		Colony opaque, coloured	4
4	{	Colour white	<i>A. lacteum</i> , v. Dr. (Med.)
		Colour orange-red.....	<i>A. conicum</i> , Olivi. (Med.)

* Possibly this species ought to be referred to *Amaroucium*.

2	{	Atrial languet trilobed.....	5
		Atrial languet simple	6
5	{	Transparent, with orange pigment on anterior end of endostyle.	
		<i>A. punctum</i> *, Giard. (N.W. Eur.)	
		White colour	<i>A. albicans</i> , M.-Edw. (N.W. Eur.)
6	{	Colony sandy	7
		Colony not sandy	8
7	{	Few folds, 5, in stomach-wall	<i>A. subacutum</i> , v. Dr. (Med.)
		Many folds, 10 or more	9
9	{	Of a dark-brown colour	<i>A. fuscum</i> , v. Dr. (Med.)
		Of a light colour	10
10	{	Of a greyish-yellow tint, much sand .	<i>A. densum</i> , Giard. (N.W. Eur.)
		Of a light-brown tint, little sand.....	<i>A. commune</i> , v. Dr. (Med.)
8	{	Colony on a short peduncle	11
		Not pedunculated	12
11	{	Colour black	<i>A. nigrum</i> , Herdm. (A. Arct.)
		Colour not black	13
13	{	Stigmata small, short, and inconspicuous	14
		Stigmata moderately long	15
14	{	Stomach spherical	<i>A. globosum</i> , Herdm. (A. Arct.)
		Stomach cylindrical	<i>A. variabile</i> , Herdm. (A. Arct.)
15	{	Colony grey, with yellowish ascidiozooids.	
		<i>A. colelloides</i> , Herdm. (S. Atl.)	
16	{	Whole colony of a reddish tint	16
		Of an orange-red	<i>A. proliferum</i> , M.-Edw. (N.W. Eur., Med.)
16	{	Of a pale rose-red	<i>A. roseum</i> , D. Valle. (Med.)
12	{	Colour white	<i>A. albidum</i> , Herdm. (Austr.)
		Colour not white	17
17	{	Ascidiozooids very small, less than 5 mm. long.....	18
		Ascidiozooids not small, more than 5 mm. long	19
18	{	Stigmata well developed	<i>A. lævigatum</i> , Herdm. (Mag.)
		Stigmata small	20
20	{	Colony pale liver-coloured, opaque... ..	<i>A. hepaticum</i> , Herdm. (?)
		Colony light grey, transparent	<i>A. recumbens</i> , Herdm. (Mag.)
19	{	Atrial languet long	<i>A. irregulare</i> , Herdm. (Mag.)
		Atrial languet short and inconspicuous	21
21	{	Numerous stigmata in branchial sac, 18-20 rows.	
		<i>A. torquatum</i> , v. Dr. (Med.)	
		Comparatively few stigmata, few rows	22
22	{	Intestinal loop long and narrow	<i>A. complanatum</i> , Herdm. (A. Arct.)
		Intestinal loop short	<i>A. pallidulum</i> , Herdm. (Mag.)

ATOPOGASTER, *Herdman*, 1885.

Colony massive and usually of large size.

Systems simple or inconspicuous.

Ascidiozooids large or small, always much elongated antero-posteriorly. Branchial aperture 6-lobed.

Test thick, and usually cartilaginous and tough; not incrustated with sand.

* The *Morchellioopsis Pleyberianus* of Lahille.

Branchial sac usually well developed.

Alimentary canal large. Stomach-wall folded transversely.

Postabdomen long.

The species of *Atopogaster* are as follows:—

{ Ascidiozooids arranged in distinct circular systems.		
{ Systems inconspicuous		<i>A. gigantea</i> , Herdm. (Mag.)
1	{ Ascidiozooids large, more than 1 cm. in length.....	2
	{ Ascidiozooids small, less than 1 cm. in length	3
2	{ Colour orange	<i>A. aurantiaca</i> , Herdm. (Austr.)
	{ Colour light grey	<i>A. informis</i> , Herdm. (?)
3	{ Colour yellowish grey	<i>A. elongata</i> , Herdm. (Mag.)
	{ Colour paler, dull whitish grey	<i>A. elongata</i> , var. <i>pallida</i> . (S. Atl.)

SIGILLINA, Savigny, 1816.

Colony elongated, pedunculated, attached.

Test gelatinous.

Ascidiozooids very long, divided into thorax, abdomen, and postabdomen. Branchial and atrial apertures both 6-lobed.

Branchial sac very short. No internal longitudinal bars.

Alimentary canal forming an abdomen which is larger than the thorax. Stomach-wall folded longitudinally.

Gonads in the very long slender abdomen, which is prolonged down through the colony and its peduncle.

This contains the single species *Sigillina australis*, Savigny, from the S.E. coast of Australia.

SYNOICUM (*Phipps*, 1774), Sav. 1816.

Colony sessile or pedunculated. Each system forming a separate club-shaped mass; systems simple.

Test semi-cartilaginous, not sandy.

Ascidiozooids divided into thorax, abdomen, and postabdomen. Branchial aperture 6-lobed, and atrial 6-lobed but irregular, the three anterior lobes being large.

Branchial sac long. No internal longitudinal bars and no papillæ. Many rows of stigmata.

Alimentary canal forming an abdomen as large as thorax; intestine not twisted. Stomach-wall areolated.

Gonads in a postabdomen of moderate length, not separated from abdomen by constriction.

This contains the species *Synoiicum turgens*, Phipps, from Spitzbergen.

SIDNYUM, *Savigny*, 1816.

Colony massive, or formed of a number of lobes, one corresponding to each system.

Systems compound.

Ascidiozooids elongated and distinctly divided into regions. Branchial aperture 6-lobed; atrial aperture not provided with a languet.

Test gelatinous.

Branchial sac well developed.

Alimentary canal forming a narrow loop. Stomach-wall areolated or irregularly thickened.

Postabdomen long, and separated from the abdomen by a constriction.

This contains two species:—

- | | | |
|---|---|---|
| { | Colony a globular mass, with broad rounded upper surface. | |
| | | <i>S. pallidum</i> , Herdm. (A. Arct.) |
| { | Colony lobed, each system forming a truncated cone. | |
| | | <i>S. turbinatum</i> , Sav. (N.W. Eur.) |

MORCHELLIUM, *Giard*, 1872.

Colony massive, sessile, or pedunculated.

Systems compound, irregular, and usually inconspicuous.

Ascidiozooids elongated, but not distinctly divided into regions. Branchial aperture 6-lobed.

Test gelatinous or cartilaginous.

Branchial sac large and well developed.

Alimentary canal usually large. Wall of stomach areolated or irregularly thickened.

Postabdomen large, but not distinctly separated from the abdomen.

This contains two species:—

- | | | |
|---|---------------------------|---------------------------------------|
| { | Colony pedunculated | <i>M. argus</i> , M.-Edw. (N.W. Eur.) |
| { | Colony sessile | <i>M. Giardi</i> , Herdm. (A. Arct.) |

MORCHELLIOIDES *, *Herdman*, 1885.

Colony massive, sessile.

Systems compound, inconspicuous.

Ascidiozooids elongated, but not distinctly divided into regions. Branchial aperture 8-lobed; atrial aperture anterior.

* This section is very closely related to the next, *Parascidia*.

Test gelatinous, not sandy.

Branchial sac large and well developed.

Alimentary canal large. Wall of stomach areolated or irregularly thickened.

Postabdomen large, but not distinctly separated from the abdomen by any constriction.

Morchellioides contains two species, which may be distinguished as follows:—

- | | | |
|---|--|--|
| { | With muscle-fibres in the transverse vessels; branchial lobes rounded. | |
| | <i>M. affinis</i> , Herdm. (A. Arct.) | |
| { | No muscle-fibres in vessels; branchial lobes pointed. | |
| | <i>M. Alderi</i> , Herdm. (N.W. Eur.) | |

PARASCIDIA *, *Milne-Edwards*, 1842.

Colony massive, attached.

Test gelatinous.

Ascidiozooids having thorax, abdomen, and postabdomen. Branchial aperture 8-lobed.

Branchial sac with no internal longitudinal bars and no papillæ.

Alimentary canal with stomach areolated or pseudo-areolated †.

Postabdomen separated from abdomen by a constriction.

This group has had the following 4 species referred to it:—

- | | | |
|-----|---|---|
| { | Colony fan-shaped, pedunculated, lobed, orange. | |
| | <i>P. flabellata</i> , Ald. (N.W. Eur.) | |
| 1 { | Colony globular or forming a flattish expansion | 1 |
| | Colony small, globular, pale yellow... <i>P. flavum</i> , M.-Edw. (N.W. Eur.) | |
| 2 { | Colony large, flat-topped or lobulated | 2 |
| | Amber-coloured | <i>P. Forbesi</i> , Ald. † (N.W. Eur.) |
| 2 { | Pale red | <i>P. Flemingi</i> , Ald. † (N.W. Eur.) |

FRAGARIUM, *Giard*, 1872.

Colony massive, attached.

Systems compound; large common cloacal aperture with denticulated margin.

Ascidiozooids having thorax, abdomen, and postabdomen. Branchial aperture 8- (may be 6-12-) lobed; atrial anterior.

* Labille states that this genus was intended by Milne-Edwards to include forms with the stomach-wall longitudinally folded, and that therefore it is synonymous with the genus *Fragarium* of Giard. I believe it will cause less confusion to leave the definitions of these groups as they now are.

† The thickenings being in the form of longitudinal folds broken up into little knob-like or ellipsoidal projections.

‡ These may possibly be one species.

Branchial sac with no internal longitudinal bars.

Tentacles simple, 12, of two sizes placed alternately.

Alimentary canal not twisted. Stomach-wall longitudinally folded.

Postabdomen long, separated off from abdomen by a slight constriction.

There are two species of *Fragarium*:—

- { Colour rose-red, branchial siphon white *F. elegans*, Giard. (N.W. Eur.)
- { Colour yellow-red, branchial siphon colourless. *F. arcolatium*, D. Ch. (Med.)

FRAGAROIDES *, *Maurice*, 1888.

Colony rounded, massive, of cartilaginous consistency, having numerous compound systems. External cloacal apertures few.

Ascidiozooids with 8 branchial lobes. Atrial aperture not lobed, but with a moderately large atrial languet. Thorax larger than abdomen. Postabdomen very long, not pedunculated.

Branchial sac large, with about a dozen rows of stigmata.

Dorsal languets wide.

Tentacles 14, 6 large and 6 small alternately, and 2 additional, very small, placed one at each side of the base of the large medio-dorsal tentacle.

Stomach with longitudinal folds.

Postabdomen not separated from abdomen by any constriction.

This contains the single species *Fragaroides aurantiacum*, Maurice, from Villefranche-sur-Mer (Med.).

CIRCINALIUM, *Giard*, 1872.

Colony polymorphic, sessile.

Systems absent or simple.

Ascidiozooids with thorax, abdomen, and postabdomen. Branchial aperture 8-lobed, atrial anterior.

Branchial sac moderately large, no internal longitudinal bars.

Stomach-wall folded.

Postabdomen very long.

This contains the species *Circinalium concreescens*†, Giard,

* This subgenus is most closely related to *Fragarium*, and probably ought to be united with it.

† According to Lahille, this is the *Sidnyum turbinatum* of Savigny and of Forbes.

from the north coast of France and the Mediterranean, which has several varieties, differing from one another in the degree of concrescence between the ascidiozooids and systems and lobes of the colony.

Unrecognizable Polyclinidæ.

Amaroucium glabrum, Verr. (E. N. Am.)

A. pallidum, Verr. (E. N. Am.)

A. pellucidum, Verr. (E. N. Am.)

A. stellatum, Verr. (E. N. Am.)

A. constellatum, Verr. (E. N. Am.)

A. pomum (?). (N.W. Eur.)

A. papillosum, Ald. (N.W. Eur.)

A. simulans, Giard. (N.W. Eur.)

Aplidium nutans, Johnst. (N.W. Eur.)

Macroclinum crater, Verr. (E. N. Am.)

Polyclinum succineum, Ald. (N.W. Eur.)

P. cerebriforme, Ald. (N.W. Eur.)

Family IV. DIDEMNIDÆ, Giard, 1872.

Colony usually flat, thin, and incrusting, rarely thick and massive, never pedunculated.

Systems complicated and irregular, inconspicuous or absent. Common cloacal apertures usually conspicuous.

Ascidiozooids rather small, divided into two regions—thorax and abdomen. Branchial aperture 6-lobed; atrial plain or provided with an atrial languet.

Test gelatinous or cartilaginous, usually containing stellate calcareous spicules. Ectodermal processes well developed, and provided with muscle-fibres so as to form retractor muscles.

Branchial sac small and not well developed. Rows of stigmata few, usually three or four (rarely six).

Alimentary canal united to thorax by a narrow neck. Stomach usually smooth-walled.

Gonads placed alongside the intestinal loop. Ovary very simple; ova large. Male system consisting of a single large testis, around which the first part of the vas deferens is coiled spirally.

Gemmation from the pyloric region; thorax and abdomen of the new ascidiozooid formed from separate buds. Embryonic blastogenesis rudimentary only.

The genera * in this family (which I use in the restricted sense, as not including Diplosomidæ and Cœlocormidæ) may be distinguished as follows:—

	{	Colony thick and fleshy	1
		Colony thin, incrusting	2
1	{	Three rows of stigmata	Didemnum.
		Four rows of stigmata	Didemnoides.
2	{	Four rows of stigmata	Leptoclinum.
		Six rows of stigmata	Eucœlium.

DIDEMNUM †, Savigny, 1816.

Colony usually thick and fleshy, rarely thin and incrusting.

Ascidiozooids with the atrial aperture on the dorsal edge of the thorax, often placed far back. Atrial siphon lobed or simple. No atrial languet present. Branchial aperture 6-lobed.

Test gelatinous or cartilaginous, usually not very hard or stiff. Stellate calcareous spicules are usually present.

Branchial sac with three rows of stigmata.

Tentacles eight in number.

The species may be distinguished as follows:—

	{	Test containing spicules	1
		Test with no spicules	2
2	{	Surface deeply cut up by corrugated sulci. <i>D. tortuosum</i> , v. Dr. (Med.)	3
		Surface not cut up.....	
3	{	Colour yellow, with dark-brown spots. <i>D. inarmatum</i> , v. Dr. (Med.)	
		Colour dull grey <i>D. inerme</i> , Herdm. (N. Atl.)	
1	{	Branchial sac prolonged beyond third row of stigmata. <i>D. graphicum</i> , Lah. (Med.)	4
		Branchial sac not prolonged	
4	{	Colony white, vas deferens takes 8 turns. <i>D. niveum</i> , Giard. (N.W. Eur.)	5
		Colony not white	
5	{	Colour yellow to brown	6
		Colour blue or greenish or dark grey.....	7
6	{	Colour rich dark brown <i>D. Savignii</i> , Herdm. (? S. Atl.)	8
		Colour yellow and orange.....	
8	{	Colour bright yellow, vas deferens takes 12 turns. [Med.] <i>D. cereum</i> ‡, Giard. (N.W. Eur.,	
		Colour orange <i>D. aurantiacum</i> , Herdm. (Austr.)	

* *Lissoclinum*, Verrill, containing two species (*L. aureum* and *L. tenerum*) from the east coast of N. America, is not sufficiently described. It will probably come under *Leptoclinum*.

† Including *Trididemnum* of Della Valle.

‡ According to Lahille, *D. sargassicola*, Giard (with several varieties), is a variety of this species.

7	{	Colour grey-green, with transparent surface-layer.	
			<i>D. bicolor</i> , v. Dr. (Med.)
		Colour not green	9
9	{	Colour steel-blue	<i>D. lobatum</i> , Grube. (Med.)
		Colour dark grey to black	<i>D. fallax</i> , Lahille. (Med.)

The following species cannot be placed :—

Trididemnum benda, Della Valle. (Med.)

Didemnum Grubei, v. Dr. (Med.)

D. variolosum, Grube. (Med.)

D. roseum (?), Delle Ch. (Med.)

DIDEMNOIDES, von Drasche, 1883.

Colony thick and fleshy.

Test containing stellate calcareous spicules.

Branchial sac with 4 rows of stigmata.

This genus, or subgenus, contains the following species :—

{	Colour wine-red ; spicules numerous	<i>D. macrophorum</i> *, v. Dr. (Med.,
		[N.W. Eur.]
{	Colour resinous yellow-brown ; spicules few.	
		<i>D. resinaceum</i> , v. Dr. (Med.)

LEPTOCLINUM †, Milne-Edwards, 1841.

Colony forming a hard, thin, incrusting layer, rarely thick and massive.

Ascidiozooids with the atrial aperture on or near the anterior end of the body, and provided with a long atrial languet.

Test very hard and firm, densely crowded with calcareous spicules.

Branchial sac usually with four rows of stigmata.

This genus contains a very large number of so-called species, of which, however, many may be merely synonyms or varieties, or merely local and seasonal conditions. The descriptions of the majority of these are so imperfect, that it is impossible to do more than give a list, with an indication of any noteworthy character and of the geographical distribution.

Leptoclinum fulgidum, M.-Edw. (N.W. Eur., Med.)

L. coccineum, v. Dr. (Med.)

L. commune, D. Valle. (Med.)

L. cinnabarinum, Grube. (Med.)

* *Didemnum rubellum*, Grube, may be this species.

† Including *Tetradidemnum* of Della Valle.

- Leptoclinium candidum*, Sav. (Red S., Med.)
L. Lacazii, Giard. (N.W. Eur.) [Vas deferens has only 2 or 3 turns.]
L. maculatum, M.-Edw. (N.W. Eur., Med.) [Vas def. has 12 turns.]
L. marginatum, v. Dr. (Med.)
L. coriaceum, v. Dr. (Med.)
L. gelatinosum, M.-Edw. (N.W. Eur., Med.)
L. granulosum, v. Dr. (Med.)
L. asperum, M.-Edw. (N.W. Eur., Med.)
L. dentatum, D. Valle. (Med.)
L. exaratum, Grube. (Med.)
L. tridentatum, v. Dr. (Med.)
L. durum, M.-Edw. (N.W. Eur., Med.)
L. perspicuum, Giard. (N.W. Eur.)
L. perforatum, Giard. (N.W. Eur.)
L. tonga, Herdm. (S. Pac.)
L. Moseleyi, Herdm. (Mal.)
L. speciosum, Herdm. (S. Atl.)
L. annectens, Herdm. (S. Atl.)
L. tenue, Herdm. (S. Pac., N. Atl.)
L. propinquum, Herdm. (Mag.)
L. neglectum, Herdm. (?)
L. albidum, Verr. (E. N. Am., Atl.)
L. luteolum, Verr. (E. N. Am.)
L. subflavum, Herdm. (A. Arct.)
L. Jeffreysi, Herdm. (A. Atl.)
L. Carpenteri, Herdm. (? N. Atl.)
L. Thomsoni, Herdm. (? N. Atl.)
L. Edwardsi, Herdm. (S. Atl.)
L. japonicum, Herdm. (Jap.)
L. Jacksoni, Herdm. (Austr.)
L. rubicundum, Herdm. (A. Arct.) [Colour yellow to rust-brown.]
Tetradidemnum gigas, D. Valle. (Med.)
Eucælium parasiticum, Giard. (N.W. Eur.)

EUCÆLIUM, Savigny, 1816.

Colony thin, incrusting; common cloacal apertures visible, slit-like.

Test filled with markedly stellate calcareous spicules.

Mantle thin and transparent.

Ascidiozooids with the branchial aperture circular or imperfectly lobed; atrial small, indistinct.

Branchial sac with 6 rows of stigmata.

Alimentary canal with a small swelling on the intestine behind the stomach.

The only species that with certainty belongs to this genus is

Eucælium hospitolum, Sav., from the Red Sea and the Mediterranean; but the following have been placed under *Eucælium* :—

E. ravum, Grube. (Med.)

E. parasiticum, Giard. (N.W. Eur.) [A *Leptoclinum*.]

E. croceum, Risso. (Med.)

E. flavidum, Risso. (Med.)

E. subgelatinosum, D. Ch. (Med.)

E. roseum, D. Ch. (Med.)

Family V. DIPLOSOMIDÆ, Giard, 1871.

Colony forming a thin incrusting layer, rarely thickened, never pedunculated.

Systems irregular, usually inconspicuous. Common cloacal apertures usually visible.

Ascidiozooids divided into two distinct regions, thorax and abdomen.

Test soft and gelatinous, usually transparent, sometimes pigmented, rarely containing calcareous spicules. Vascular ectodermal appendages provided with muscle fibres penetrating the test.

Branchial sac large, with four rows of stigmata.

Dorsal lamina represented by large languets.

Alimentary canal extending behind the branchial sac. Stomach smooth-walled.

Gonads behind the intestinal loop or on its right side. Testis forming more than one mass. Vas deferens not coiled spirally.

Gemmation pyloric. Larva gemmiparous.

There are two distinct genera :—

- | | |
|--|-----------------------|
| { With calcareous spicules in the test | Diplosomoides. |
| { With no spicules in the test | Diplosoma. |

DIPLOSOMOIDES*, Herdman, 1886.

Colony usually thin and incrusting, sometimes only slightly attached.

Test gelatinous, sometimes firm externally, more or less opaque and of a whitish colour. Calcareous stellate spicules present in the superficial layer. Otherwise as *Diplosoma*.

* Lahille has recently used this genus in a new and totally distinct sense, and therefore the species he refers to *Diplosomoides* are not related to my species.

There are two species known to me :—

- | | | |
|---|--|---------------------------------|
| { | With a group of spicules on each side of thorax. | [(Med.) |
| | <i>D. pseudoleptoclinum</i> , v. Dr. | |
| { | With no such thoracic groups of spicules. | <i>D. molle</i> , Herdm. (Mal.) |

DIPLOSOMA *, *Macdonald*, 1858.

Colony usually thin and incrusting, rarely thick.

Systems irregular. Common cloacal apertures rounded.

Ascidiozooids divided into thorax and abdomen. Branchial aperture usually 6-lobed, atrial a simple aperture.

Test soft, gelatinous, usually transparent, sometimes pigmented, never with calcareous spicules. Containing muscular processes from the ascidiozooids.

Branchial sac large, with four rows of stigmata.

Alimentary canal moderately large. Stomach ellipsoidal and smooth-walled.

Gonads close to the intestinal loop. Vas deferens straight.

Gemmation pyloric. Larva gemmiparous.

The following species (?) can be distinguished in the genus *Diplosoma* :—

- | | | | |
|---|---|--|--|
| | { | Branchial aperture 6-lobed | 1 |
| | { | Branchial aperture circular, lobes absent or small | 2 |
| 2 | { | Test pigmented | <i>D. spongiforme</i> , Giard. (N.W. [Eur. & Med.]) |
| | { | Test not pigmented | <i>D. Macdonaldi</i> , Herdm. (S. Atl.) |
| 1 | { | Colony thin, incrusting | 3 |
| | { | Colony thick, fleshy | 4 |
| 3 | { | Larva forms 2 ascidiozooids | <i>D. Rayneri</i> , Macdon. (Austr.) |
| | { | Larva forms 3 ascidiozooids | <i>D. crystallinum</i> , Giard. (N.W. [Eur. & Med.]) |
| 4 | { | Colour grey or dark green | <i>D. chamæleon</i> , v. Dr. (Med.) |
| | { | Colour yellow-brown | <i>D. carnosum</i> , v. Dr. (Med.) |

The following names have also been used for forms coming under this genus, but are either synonyms of some of the above or are so imperfectly known that they cannot be placed :—

- D. gelatinosum*, M.-Edw. (N.W. Eur.)
D. Listerianum, Della Valle. (Med.)
D. Koehlerianum, Lahille. (N.W. Eur.)
D. punctatum, Forb. (N.W. Eur.)
D. zosterarum, Jourdain. (N.W. Eur.)
D. gyrosum, Grube. (Med.)
D. Listeri, Lahille. (N.W. Eur.)

* Including *Astellium*, Giard; *Brevistellium*, Jourdain; *Pseudodidemnum*, Giard.

Family VI. CÆLOCORMIDÆ, *Herdman*, 1886.

Colony massive, deeply concave on the upper surface, not attached.

Ascidiozooids large, scattered all over the surface. Branchial apertures 5-lobed.

Test soft and gelatinous. Test-cells numerous. Calcareous spicules present in the outer layer of the colony.

Branchial sac large and well developed.

Dorsal lamina represented by a series of languets.

Alimentary canal extending beyond the branchial sac posteriorly, but not forming a distinct abdomen. Stomach smooth-walled.

Gonads hermaphrodite in the adult ascidiozoid. Testis composed of a number of pyriform vesicles, which join a spirally coiled vas deferens.

This family contains the single genus *Cælocormus*.

CÆLOCORMUS, *Herdman*, 1886.

Colony massive, but not attached; deeply concave on the upper surface, so as to contain a large central cavity.

Ascidiozooids large, not distinctly divided into regions; branchial aperture 5-lobed.

Test soft and gelatinous. Test-cells numerous and large. No bladder-cells. Calcareous spicules present in the superficial layer.

Branchial sac large. Stigmata very long and narrow.

Dorsal lamina represented by a series of long triangular languets.

Tentacles well developed.

Alimentary canal extending beyond the branchial sac posteriorly, but not forming a distinct abdomen. Stomach smooth-walled.

Gonads not large. Ovary only present in the adult ascidiozoid. Testis formed of a number of spermatic vesicles. Vas deferens spirally coiled.

One species, *Cælocormus Huxleyi*, Herdm., from the S. Atlantic at a depth of 600 fathoms.

Family VII. POLYSTYELIDÆ, *Herdman*, 1886.

Colony massive or incrusting, sessile, rarely pedunculated, or formed of small masses connected by stolons. No common cloacal cavities present.

Ascidiozooids large and usually short-bodied, rarely with a distinct abdomen. Both apertures 4-lobed, and opening directly to the exterior.

Test firm and cartilaginous. Matrix generally fibrillated, test-cells small and inconspicuous, bladder-cells rarely or never present. Vessels abundant, branched, and provided with distinct terminal bulbs.

Branchial sac large and well developed. Folds sometimes present. Internal longitudinal bars strong and fairly numerous.

Dorsal lamina in the form of a plain membrane.

Tentacles numerous, simple.

Alimentary canal usually placed alongside the branchial sac, rarely extending beyond it posteriorly.

Gonads in the form of polycarps attached to, or imbedded in, the mantle, and projecting into the peribranchial cavity.

Gemmation effected by means of the vascular prolongations from the ascidiozooids into the common test (?).

The genera which have been referred to this family may be distinguished as follows :—

		Ascidiozooids projecting above surface of colony	1
		Ascidiozooids completely embedded in common test	2
1	{	Abdomen as long as the thorax	Thylacium.
		No abdomen present	Polystyela.
2	{	Colony formed of small masses united by stolons.	Chorizocormus.
		Colony not broken up into masses and stolons	3
3	{	Colony thick and massive.....	4
		Colony thin and incrusting.....	Synstyela.
4	{	Test incrustated with sand	Oculinaria*.
		Test not (or very slightly) incrustated with sand.....	Goodsiria.

THYLACIUM, *Carus*, 1850.

Colony formed of individuals projecting from a common fleshy base.

* This genus is only imperfectly known. The description is insufficient.

Ascidiozoid having the body divided into thorax and abdomen. Branchial and atrial apertures 4-lobed.

Two species have been briefly described, but I am unable at present to find any character which will separate them:—*T. Sylvani*, Carus (N.W. Eur.); *T. Normani*, Alder (N.W. Eur.).

POLYSTYELA *, Giard, 1874.

Colony consisting of a basal part from which the ascidiozooids project.

Ascidiozooids not divided into thorax and abdomen (?).

Only one species is known, *Polystyela Lemirri*, Giard, from the coast of France.

CHORIZOCORMUS, Herdman, 1886.

Colony consisting of a number of distinct masses of small size united by irregular branched stolons.

Ascidiozooids placed either singly or in small groups in the test. When more than one are present, they do not project above the general level. The body is not divided into thorax and abdomen.

Test relatively small in amount, slightly incrustated with sand. Test-cells few, and bladder-cells absent. Vessels present in the test and stolons.

Branchial sac well developed. Rudimentary folds present. Internal longitudinal bars strong.

Dorsal lamina in the form of a plain narrow membrane.

Tentacles well developed.

Alimentary canal not prolonged behind the branchial sac.

Gonads in the form of polycarps.

Only one species, *Chorizocormus reticulatus*, Herdm., has been described, but I have examined three other new species from Australia, so I include them in the following table:—

1	{	With rudimentary folds in the branchial sac.	
		<i>C. reticulatus</i> , Herdm. (A. Arct.)	
		With no rudimentary folds	1
1	{	With more than 20 atrial tentacles. <i>C. Sydneysensis</i> , n. sp. (Austr.)	
		Atrial tentacles not more than 20	2
2	{	With 7 rows of stigmata, and 16 branchial tentacles.	
		<i>C. leucophæus</i> , n. sp. (Austr.)	
		With 10 rows of stigmata, and 10 branchial tentacles.	
		<i>C. subfuscus</i> , n. sp. (Austr.)	

* Possibly not distinct from *Thylacium*.

SYNSTYELA, *Giard*, 1874.

Colony thin and incrusting.

Ascidiozooids large and closely placed, completely imbedded in the common test. Body not divided into thorax and abdomen.

Test relatively small in amount. Matrix sometimes fibrillated; test-cells small; bladder-cells absent; vessels present.

Branchial sac well developed. Rudimentary folds present. Internal longitudinal bars well marked.

Dorsal lamina in the form of a plain membrane.

Tentacles well developed.

Alimentary canal not prolonged behind the branchial sac. Stomach folded longitudinally.

Gonads in the form of polycarps attached to the mantle.

Two species of *Synstyela* are known:—

{	Flesh-colour, marked with red.....	<i>S. variegata</i> *, Ald. (N.W. Eur.)
	Light grey, with bluish and pink tints.	[Mal.]
		<i>S. incrustans</i> , Herdm. (Mag. &

GOODSIRIA, *Cunningham*, 1871.

Colony massive, sessile or pedunculated, not incrusting with sand.

Ascidiozooids large and ovate in shape, completely imbedded in the common test; not divided into thorax and abdomen. Apertures 4-lobed, both on the anterior end.

Test solid, cartilaginous, not sandy. Matrix delicately fibrillated. Vessels present.

Branchial sac well developed; folds present, rudimentary, or absent; internal longitudinal bars always present.

Dorsal lamina in the form of a plain membrane.

Alimentary canal not prolonged behind the branchial sac. Stomach folded longitudinally.

Gonads in the form of polycarps.

The species of *Goodsiria* may be distinguished thus:—

{	Test somewhat sandy; ascidiozooids elongated.	
		<i>G. lapidosa</i> , n. sp. (Austr.)
{	Test not sandy; ascidiozooids rounded	1

* Possibly *Giard's Synstyela* from the French coast may be distinct from this British species.

- | | | | |
|---|---|---|---|
| 1 | { | Branchial sac folded; colony discoid. <i>G. placenta</i> , Herdm. (S. Atl.) | |
| | { | Branchial sac not folded; colony not discoid | 2 |
| | { | Colony rounded or pyriform, pedunculated. | [Mag.] |
| 2 | { | Colony elongated or irregular, sessile. | <i>G. pedunculata</i> , Herdm. (S. Atl.), |
| | | | <i>G. coccinea</i> , Cunn. (Mag.) |

OCULINARIA, Gray, 1868.

Colony massive, erect, elongated.

Test solid, containing sand-grains.

Ascidiozooids completely imbedded in the test.

This imperfectly described genus contains a single species, *Oculinaria australis*, Gray, from the western coast of Australia.

Suborder III. ASCIDIÆ LUCIÆ, Sav., 1816.

(ASC. SALPIFORMES, Auct.).

This group contains free-swimming pelagic Ascidians which reproduce by gemmation so as to produce colonies having the form of a hollow cylinder closed at one end. The ascidiozooids forming the colony are embedded in the common test in such a manner that the branchial apertures all open on the outer surface, and the atrial apertures on the inner surface next to the central cavity of the colony. The first four ascidiozooids are produced by gemmation from a rudimentary larva (the cyathozooid) developed sexually.

The Ascidiæ Luciæ include a single family, the Pyrosomidæ, containing one well-marked genus, *Pyrosoma*.

Family PYROSOMIDÆ, T. R. Jones, 1848.

Colony free-swimming, and having the form of a hollow cylinder closed at one end.

Systems—only one present, the terminal aperture of the colony being the common cloacal opening.

Ascidiozooids elongated antero-posteriorly, and placed in a single layer with their branchial apertures opening on the surface of the colony, and their atrial apertures into the axial tube or common cloaca. Body of ascidiozooid not divided externally into regions. Apertures not lobed.

Test gelatinous and transparent, containing no spicules, but many small cells.

Branchial sac well developed, not folded. Consisting of

numerous transverse vessels separated by narrow slits (the stigmata) and numerous internal longitudinal bars.

Tentacles present; simple.

Dorsal lamina in the form of languets.

Alimentary canal placed posteriorly to the branchial sac.

Gonads situated in the wall of the peribranchial cavity, posterior to the branchial sac. The embryo becomes a rudimentary larva (the cyathozoid), which gives rise to the first ascidiozooids of the colony.

Gemmation takes place from a ventral and posteriorly-placed stolon.

This family contains the single genus *Pyrosoma*, which may be characterized as follows:—

PYROSOMA, Péron, 1804.

Colony free-swimming, and having the form of a cylinder with a large axial cavity closed at one end and open at the other.

Systems—only one present, the terminal aperture of the colony being the single common cloacal opening, and the axial cavity the common cloaca.

Ascidiozooids elongated antero-posteriorly, and placed in a single layer with their anterior ends external and their posterior ends internal. Branchial apertures anterior, opening on the surface of the colony. Atrial apertures posterior, opening into the centrally-placed common cloaca. Body not divided externally into thorax and abdomen. Apertures not lobed.

Test gelatinous and transparent, containing numerous stellate branched cells.

Branchial sac well developed, not folded, and not extending to the posterior end of the body. Vessels of two kinds—transverse vessels which are numerous and closely placed, leaving elongated slits between, which are directed transversely to the antero-posterior axis of the body; and longitudinal vessels, which are not quite so numerous, and cross the transverse vessels so as to form small quadrangular meshes.

Tentacles simple, one ventrally placed larger than the rest.

Dorsal lamina represented by a series of eight or more tapering languets.

Dorsal tubercle with a simple aperture.

Alimentary canal short and simple, placed posteriorly to the branchial sac.

Gonads hermaphrodite, placed posteriorly to the branchial sac, in diverticula of the peribranchial cavity.

Gemmation from a ventrally-placed stolon formed at the posterior end of the endostyle.

The following is a scheme of the known species of *Pyrosoma*. *P. atlanticum* and *P. giganteum* are, however, such closely related forms, that a number of characters have to be taken into account in distinguishing between them. I know of no one good character by which these two species can be separated:—

	{	Ascidiozooids arranged in regular verticils.	
		<i>P. elegans</i> , Les. (Atl., Med.)	
	{	Ascidiozooids arranged irregularly	1
1	{	Surface of the colony provided with short sharp spines only.	
		<i>P. spinosum</i> , Herdm. (Atl.)	
	{	Surface of the colony provided with large processes of the test	2
2	{	Colony conical, processes of test subulate or conical.	
		<i>P. atlanticum</i> , Péron. (Atl.)	
	{	Colony cylindrical, processes of test flattened and lanceolate at their free ends	
		<i>P. giganteum</i> *, Les. (Atl., Med., [A. Arct., Mal.)	

Order II. THALIACEA (Sav.), v. d. Hoeven.

The Thaliacea are free-swimming pelagic forms, which may be either simple or compound, and, in the adult, are never provided with a tail or a notochord.

The test is permanent, and may be either well developed or very slight.

The musculature of the mantle is in the form of more or less complete circular bands, by the contraction of which locomotion is effected.

The branchial sac has either two large or many small apertures (stigmata), leading to a single peribranchial cavity which communicates with the exterior by the atrial aperture.

The anus opens into the peribranchial cavity.

Alternation of generations occurs in the life-history, and may be complicated by polymorphism.

This order includes all the pelagic Tunicata with the exception of *Pyrosoma* and the Appendiculariidae. It seems a natural

* It must be remembered that *P. giganteum* is not the largest species. *P. spinosum*, discovered during the 'Challenger' Expedition, is many times larger than Lesueur's species.

well-defined group, characterized amongst the free-swimming forms by the absence of a tail and a notochord in the adult, and by the occurrence of alternation of generations in the life-history. Temporary colonies may be formed at one stage in the life-history, but they never increase in size by gemmation from the ascidiozooids, which eventually separate from one another. This, along with the alternation of generations, distinguishes the Thaliacea from the Ascidia Luciae Salpiformes), and the absence of a tail and notochord separates them from the Larvacea.

The Thaliacea may be divided into two groups, the Cyclomyaria and the Hemimyaria.

Suborder I. *CYCLOMYARIA* (Krohn), Uljanin, 1884.

Free-swimming pelagic forms which exhibit alternation of generations in their life-history, but never form permanent colonies.

The body is cask-shaped, with the branchial and atrial apertures at the opposite ends. The test is more or less well-developed.

The mantle has its musculature in the form of circular bands surrounding the body.

The branchial sac is fairly large, occupying the anterior half or more of the body. It has distinct walls, and the small slit-like stigmata are usually present in its posterior part only. The peribranchial cavity is mainly posterior to the branchial sac.

The alimentary canal is placed close to the posterior end of the branchial sac.

Hermaphrodite reproductive organs are placed ventrally near the intestine.

The sexual generation in the life-history is always polymorphic.

This suborder contains a single family only.

Family DOLIOLIDÆ, *Keferstein*, 1862.

Body free, more or less barrel-shaped; branchial and atrial apertures terminal and lobed.

Test rather slightly developed.

Mantle containing transverse muscle-bands, which form hoops surrounding the body.

Branchial sac well developed. Stigmata not numerous, generally placed far back.

Dorsal lamina and *tentacles* absent.

Alimentary canal at the posterior end of the branchial sac.

Gonads hermaphrodite.

Gemmation takes place.

Life-history complicated by alternation of generations and polymorphism.

This family contains two genera, which may be distinguished as follows:—

All the muscles in the form of encircling hoops **Doliolum.**

The musculature reduced to 2 hoops at each end and two lateral S-shaped bands **Anchinia.**

DOLIOLUM, Quoy and Gaimard, 1835.

Body always more or less barrel-shaped, not attached, and never forming a colony. Branchial aperture at the anterior end, atrial at the posterior, both surrounded by lobes.

Test very thin, containing no test-cells.

Mantle containing well-developed, transversely arranged muscle-bands, which in the fully developed sexual animal are always eight in number. They surround the body like hoops.

Branchial sac usually of moderate size, occupying the anterior half or three-quarters of the body. Its wall contains transverse and fine longitudinal vessels, separated by stigmata, but no internal longitudinal bars, and it is never folded. The stigmata are placed transversely, and vary in number from five to fifty or more on each side of the sac.

Dorsal lamina and *tentacles* absent.

Nerve-ganglion placed in the median dorsal line, a little anterior to the middle of the body, and between the third and fourth muscle-bands.

Dorsal tubercle placed some distance in front of the nerve-ganglion, and surrounded by the spirally-coiled dorsal ends of the peripharyngeal bands.

Alimentary canal placed ventrally, behind the branchial sac.

Gonads ventral, opening into the peribranchial cavity near to the anus.

A tailed larva is formed, which develops into an asexual form, the blastozoid, the buds from which are polymorphic, giving rise to (a) nutritive forms, the gastrozooids; (b) foster-forms, the phorozooids; and (c) reproductive forms, the gonozooids.

Nine species of *Doliolum* are known, which may be distinguished as follows :—

1	{	Branchial sac with only a few stigmata at its posterior end, forming a straight line	1
		Branchial sac with numerous stigmata extending along the greater part of its length, and forming a curved line	2
1	{	Only 5 pairs of stigmata..... <i>D. rarum</i> , Grobben. (Med.)	
		At least 10 pairs of stigmata	3
3	{	10–12 pairs of stigmata	<i>D. Mülleri</i> , Kr. (Med.)
		25 pairs of stigmata	<i>D. Krohni</i> , Herdm. (S. Pac.)
2	{	Stigmata starting dorsally near the 1st muscle-band	4
		No stigmata reaching to the 1st muscle-band dorsally.....	5
4	{	Stigmata reaching to the 1st muscle-band ventrally. [Med.]	
		<i>D. Ehrenbergi</i> , Kr. (S. Pac., Atl.,	
		No stigmata in front of the 3rd muscle-band ventrally.	
5	{	<i>D. affine</i> , Herdm. (Pac.)	
		Stigmata starting dorsally about the 2nd muscle-band.....	6
		Stigmata starting dorsally behind the 3rd muscle-band	7
6	{	Stigmata reaching back to the 5th muscle-band.	
		<i>D. Challengeri</i> , Herdm. (Pac.)	
		Stigmata reaching back to the 6th muscle-band. [& Atl.]	
7	{	<i>D. denticulatum</i> , Q. & G. (S. Pac.)	
		Stigmata reaching only to the 5th muscle-band ventrally.	
		<i>D. Gegenbauri</i> , Ulj. (Austr., Med.)	
		Stigmata reaching nearly to the 4th muscle-band ventrally.	
		<i>D. tritonis</i> , Herdm. (N. Atl.)	

ANCHINIA* (*Eschscholtz*, 1835), *C. Vogt*.

Body rounded, somewhat elongated dorso-ventrally, not attached, and not forming a colony. Branchial aperture anterior, atrial posterior, both lobed.

Test well developed, containing branched test-cells.

Mantle having only 2 anterior and 2 posterior ring-like muscle-bands, and an S-shaped band on each side in the middle.

Branchial sac having only an oblique row of stigmata at its posterior end.

Alimentary canal forming a U-shaped loop.

Gonads placed on the right side of the body.

The life-history, so far as is known, is similar to that of *Doliolum*, but the three forms of the polymorphic sexual generation do not occur together on one stolon or outgrowth, but are produced successively:

There is only one species known, *Anchinia rubra*, Vogt, from the Mediterranean.

* The *Doliopsis* of C. Vogt.

Suborder II. *HEMIMYARIA*, Herdman, 1888.

Free-swimming pelagic forms which exhibit alternation of generations in their life-history, and in the sexual condition form temporary colonies.

The body is more or less fusiform, with the long axis antero-posterior, and the branchial and atrial apertures nearly terminal.

The test is well developed.

The musculature of the mantle is in the form of a series of transversely-running bands, which do not form complete and independent rings, as in the *Cyclomyaria*. The branchial and peribranchial cavities form a continuous space in the interior of the body, opening externally by the branchial and atrial apertures, and traversed obliquely from the dorsal and anterior end to the ventral and posterior by a long narrow vascular band which represents the dorsal lamina, the dorsal blood-vessel, and the neighbouring part of the dorsal edge of the branchial sac of an ordinary Ascidian.

The alimentary canal is placed ventrally. It may be either stretched out, so as to extend for some distance anteriorly, or, as is more usual, be concentrated to form, along with the reproductive organs, a rounded opaque mass near the posterior end of the body, known as the visceral mass or "nucleus."

The embryonic development is direct, no tailed larva being formed.

This suborder includes two very distinct families, the *Salpidæ*, which contains the typical members of the group, and the *Octacnemidæ*, including a single very remarkable form (*Octacnemus bythius*, Moseley), which in some respects does not conform with the characters given above.

Family I. *SALPIDÆ*, *Forbes*, 1853.

Body not attached, elongated; branchial and atrial apertures at the opposite ends.

Test well developed, gelatinous or cartilaginous.

Mantle with well-marked muscle-bands, which, however, do not form complete rings, but are wanting ventrally.

Branchial and *peribranchial cavities* forming a large central space opening to the exterior at both ends. Side walls of branchial sac not developed. At most only a few imperfect or rudimentary stigmata found along the dorsal edge.

Dorsal lamina in the form of a vascular ciliated band traversing the central cavity obliquely.

Alimentary canal usually forming a small coiled mass placed posteriorly and ventrally.

Gonads hermaphrodite, but ova and spermatozoa not mature together.

Reproduction also takes place by gemmation, and alternation of generations occurs in the life-history.

The embryo develops in an incubatory pouch. No tailed larva is formed.

This family includes two very distinct groups of species usually recognized as the genera *Salpa* and *Cyclosalpa*; but Lahille has recently broken the former up into four sections or subgenera, and I believe it will be convenient to follow that course.

1	{	Alimentary canal extended, no "nucleus," "chains" circular.	
		Alimentary canal coiled to form a "nucleus," "chains" ribbon-like ...	Cyclosalpa. 1
1	{	Several embryos formed at a time	Iasis.
		One embryo only at a time	2
2	{	The embryo covered	Salpa.
		The embryo exposed.....	3
3	{	The dorsal lamina or "gill" having only ciliated bands.....	Thalia.
		The "gill" having rudimentary stigmata	Pegea.

CYCLOSALPA, *Blainville*, 1827.

Alimentary canal running antero-posteriorly, and not coiled up to form a "nucleus."

Gemmation results in the formation of a chain of aggregated forms attached together in a circle.

In other particulars like *Salpa*.

This genus contains the following three species:—

1	{	With linear pigmented bands on dorsal edge.	
		With no such bands	C. pinnata , Forsk. (Atl., Pac., Med.) 1
		Aggregated form has atrial aperture terminal, posterior. Solitary form with no longitudinal muscles	C. affinis , Cham. (Atl., Pac., Med.)
		Aggregated form has atrial aperture dorsal. Solitary form with four longitudinal muscles	C. dolichosoma-virgula , Tod.-Vogt. [(Med.)]

SALPA, *Forskål*, 1775.

Body not attached, elongated, with the apertures at the opposite ends.

Test gelatinous or cartilaginous; transparent.

Mantle with muscle-bands which are more or less incomplete ventrally.

PEGEA, *Savigny*, 1816.

Branchial sac having rudimentary stigmata on its dorsal edge, alongside the dorsal lamina.

Alimentary canal coiled up to form a "nucleus."

Gemmation results in a ribbon-like band of aggregated forms.

Single embryo develops at a time. It is not covered.

In other particulars like *Salpa*.

This section contains the single species *Pegea scutigera-confœderata* *, Cuv.-Forsk. (Atl., Pac., Ind. O., Med.).

IASIS† (*Savigny*, 1816), *Lahille*, 1890.

Alimentary canal closely coiled up to form a "nucleus."

Gemmation results in a ribbon-like band of aggregated forms.

Embryos 2 or 3 in number at a time.

In other particulars like *Salpa*.

This section includes three species:—

- | | | |
|-----|---|---|
| { | With no large appendages at posterior end in solitary form. Aggregated form with anterior end narrower than posterior. | |
| | <i>I. cordiformis-zonaria</i> , Q. & G.-Pall.
[(Atl., Ind. O., Pac., Med.)] | |
| { | With a pair of large appendages at posterior end in sol. form. Agg. form with anterior end wide | 1 |
| | Appendages plain, directed laterally, no longit. ridges on test. Agg. form with aperts. terminal. <i>I. costata-Tilesii</i> , Q. & G.-Cuv. (Atl.)
[Ind. O., Pac., Med.)] | |
| 1 { | Appendages serrated, directed posteriorly and terminating longitudinal ridges of test. Agg. form with apertures dorsal | 2 |
| 2 { | Muscle-bands wider than the interspaces in agg. form.
<i>I. hexagona</i> ‡, Q. & G. (Pac., Ind. O.) | |
| | Muscle-bands much narrower than interspaces; only agg. form known.
<i>I. nitida</i> , Herdm. (Pac.) | |
| | | |

Most of the remaining species of Salpidæ which have been described or figured have been shown by Traustedt, or others, to

* *Salpa quadrata*, Herdm. (N. Atl.), appears to be closely related to this species. The single 'Challenger' specimen (sol. form) had a remarkable club-shaped dorsal lamina; but that may be an individual abnormality.

† This, however, is not the *Iasis* of Savigny, the type of which was *Salpa cylindrica*.

‡ *Salpa musculosa*, Herdm. (Atl.), and *S. echinata*, Herdm. (Atl., Pac.), are probably closely allied to this species; but as the condition of their embryos is not known, they cannot be placed with certainty in this genus. The solitary forms only are known, and they differ in several particulars from that of *Iasis hexagona*.

be more or less certainly synonyms of one or other of the preceding species. The following, however, are imperfectly known, and still in doubtful case, and may some of them be distinct species :—

- Salpa antarctica*, Meyen. (A. Arct.)
- S. antheliphora*, Pér. & Les. (Atl.)
- S. aspera*, Cham. (N. Pac.)
- S. bicornis*, Cham. (Mal.)
- S. cærulea*, D. Ch. (Med.)
- S. dubia*, Cham. (N. Pac.)
- S. emarginata*, Q. & G. (Pac.)
- S. herculea*, Dall. (N. Atl.)
- S. informis*, Q. & G. (Pac.)
- S. pyramidalis*, Less. (?)
- S. rhomboides*, Q. & G. (Pac.)
- S. rubrolineata*, Less. (?)
- S. tricuspidata*, Less. (?)
- S. tricuspidata*, Q. & G. (Pac.)
- S. vaginata*, Cham. (Mal.)

Family II. OCTACNEMIDÆ, *Herdman*, 1888.

Body flattened antero-posteriorly (?), probably attached.

Test gelatinous, thin, transparent.

Branchial sac with no stigmata or openings into the peribranchial cavity.

Alimentary canal placed dorsally and posteriorly; coiled up along with the reproductive organs to form a visceral mass or "nucleus."

Life-history unknown.

This family contains only the remarkable deep-sea genus *Octacnemus*, discovered during the 'Challenger' Expedition.

OCTACNEMUS, *Moseley*, 1876 (*Herdman*, 1888).

Body flattened antero-posteriorly (?), probably attached by the posterior end. Margins of body prolonged to form 8 conical radiating processes.

Test gelatinous, thin, transparent.

Mantle slight. Musculature in the form of narrow muscle-bands, which are mainly confined to the conical processes

Branchial sac with its length directed dorso-ventrally, and having

merely imperforate pits in its walls, and no direct connection with the peribranchial cavity.

Dorsal lamina unrepresented.

Alimentary canal coiled up along with the reproductive organs to form a visceral mass (the "nucleus"), placed at the dorsal edge of the posterior end of the body.

Gonads hermaphrodite.

This genus contains the very aberrant abyssal form *Octacnemus bythius*, Moseley, obtained during the 'Challenger' Expedition in the South Pacific from depths of 1070 and 2160 fathoms.

Order III. LARVACEA, *Herdman*, 1882.

The Larvacea, or Copelata (Gegenb.), are free-swimming pelagic forms, provided with a large locomotor appendage (the "tail"), in which there is a skeletal axis (the urochord).

A relatively large test (the "Haus") is formed with great rapidity as a secretion from the surface of the ectoderm; it is, however, merely a temporary structure which may be cast off and afterwards replaced by another.

The branchial sac is simply an enlarged pharynx with two ventral ciliated openings (stigmata) leading to the exterior. These open independently on the ventral surface. There is no separate peribranchial cavity.

The nervous system consists of a large anterior and dorsally placed ganglion, and a long nerve-cord with smaller ganglia, stretching backwards from it over the alimentary canal to reach the tail, along which it runs on the left side of the urochord.

The alimentary canal lies behind the branchial sac, and the anus opens ventrally on the surface of the body in front of the stigmata (or atriopores).

The gonads are placed at the posterior end of the body.

Gemmation does not take place, and alternation of generations and metamorphosis do not occur in the life-history.

This group contains a single family, the Appendiculariidae, all minute tailed free-swimming forms, which have undergone comparatively little degeneration, and consequently correspond more nearly to the tailed-larval condition than to the adult forms of the other groups of Tunicata.

Family APPENDICULARIIDÆ, *Bronn*, 1862.

Body more or less ovate, with the longer axis antero-posterior, and having a large appendage (the tail) attached to the ventral surface. The branchial aperture is anterior.

Test periodically developed into a very large investing-capsule, which is after a time cast off from the body.

Branchial sac is simple, and has only two openings, which are placed one on each side of the ventral edge, and lead to separate atrial apertures.

Nervous system consists of a large ganglionic mass placed dorsally near the anterior part of the body, and a nerve-cord with ganglionic thickenings which is continued posteriorly and ventrally into the appendage.

Alimentary canal lies posterior to the branchial sac. The anus opens on the exterior of the body.

Gonads, like the anus, independent of the atrial apertures.

This family contains five genera *, which may be distinguished thus:—

{ No heart, no endostyle, pharynx with 4 rows of ciliated processes.	
Kowalevskia.	
{ Heart and endostyle, no such processes in pharynx	
1	
{ Body elongated and divided into two parts; fold of integument forming	
a hood	
Fritillaria.	
{ Body compact, short; no hood	
2	
{ Rectum enormous, tail moderately long	
Appendicularia.	
{ Rectum not very large, tail very long.....	
3	
{ Body ovoid, not depressed.....	
Oikopleura.	
{ Body rhomboid, depressed	
Stegosoma.	

APPENDICULARIA (*Cham.* 1821), *Fol*, 1874.

Body contracted, depressed anteriorly, swollen posteriorly. No fold of integument forming a hood is present.

Tail moderate, measuring twice to thrice the length of the body.

Endostyle slightly curved.

Rectum enormous, larger than stomach and intestine together.

* *Vexillaria*, J. Müller, is a synonym of *Oikopleura*, and *Eurycercus*, Busch of *Fritillaria*. A remarkable form was described (no name) by Moss in 1871 as having stigmata in the wall of its branchial sac. If that is correct, and if the form really belongs to this family, it ought to be placed in a genus by itself. I would suggest for it the name *Mossia dolioloides*.

Probably this genus, in the restricted sense, contains only two or three species. The only one sufficiently described is *Appendicularia sicula*, Fol (Med.).

OIKOPLEURA (Mertens, 1831), Fol, 1872.

Body ovoid, contracted; no hood present.

Tail long, measuring from thrice to four and a half times the length of the body. It is about four to six times as long as it is broad.

Endostyle straight.

The following are the better-known species of this genus. A number of others which have been named or referred to cannot be placed. The first-known species was *Oikopleura Chamissonis*, Mertens (N. Pac.). Another form frequently referred to is *O. flabellum*, J. Müll.

	{ The "Haus" almost globular	1
	{ The "Haus" not globular, usually ovate	2
1	{ With a pre-anal fold of integument ... <i>O. spissa</i> , Fol. (Med.)	
	{ With no pre-anal fold	<i>O. speciosa</i> , Eisen. (N.W. Eur.)
2	{ Stomach and intestine of a bluish or violet colour	3
	{ Alimentary canal not blue or violet	4
3	{ Body 1 mm. long	<i>O. dioica</i> , Fol. (Atl. & Med.)
	{ Body 0.2-0.5 mm. long	<i>O. cærulescens</i> , Geg. (Med.)
4	{ Body 1 to 2 mm. long	5
	{ Body about 4 mm. long	<i>O. cophocerca</i> , Geg. (Med.)
5	{ Body 1.8 mm. long	<i>O. rufescens</i> , Fol. (Atl., Med.)
	{ Body 1.1 mm. long	6
6	{ Body elongated, narrow, tail rather wide, mouth directed upwards.	
	{	<i>O. fusiformis</i> , Fol. (Atl., Med.)
	{ Body ovato-elongate, tail very narrow, mouth directed forwards.	
	{	<i>O. albicans</i> , Leuck. (Med.)

STEGOSOMA, Chun, 1888.

Body rhomboid, depressed.

Endostyle moderately large.

Stomach and *intestine* forming an arch over the liver.

This contains a single form named by Chun.

FRITILLARIA (Q. & G. 1833), Fol, 1872.

Body elongated, more or less constricted in the middle where the tail is attached. A fold of integument on the front of the body forms a "hood."

Tail short and wide, about once and a half as long as the body.

Endostyle curved.

The species which are sufficiently known can be distinguished thus :—

	{	The tail bifurcated at its extremity.....	1
		Tail not forked	2
1	{	With long posterior processes, forks of tail not narrow. <i>F. furcata</i> , Vogt. (Med.)	
		With short posterior processes, forks of tail narrow. <i>F. megachile</i> , Fol. (Med.)	
2	{	Body bent at an angle, mouth 6-lobed. <i>F. formica</i> , Fol. (Med.)	
		Body straight, mouth not lobed	3
3	{	Body 2·25 mm. long, stinging-cells in integument. <i>F. urticans</i> , Fol. (Med.)	
		Body 1·15 mm. long, no stinging-cells... <i>F. haplostoma</i> *, Fol. (Med.)	

KOWALEVSKIA †, Fol, 1872.

Body ovoid, truncated anteriorly.

Tail large, lanceolate and pointed.

Endostyle and *heart* absent.

Pharynx with four rows of ciliated processes.

Intestine absent, except the rectum.

This remarkable genus contains a single species, *Kowalevskia tenuis*, Fol, from the Mediterranean.

Appendiculariidae have been found in nearly all seas of the world; but most of the forms recorded or preserved cannot now be referred to their proper species.

* *Appendicularia acrocerca* of Gegenbaur.

† This genus has such exceptional characters, that it might be separated from the Appendiculariidae as a distinct family.